The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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THE ZERO CREVICE IN THE MANAGEMENT OF PERIODONTAL INVOLVEMENTS

By G. R. LUNDQUIST, M.S., D.D.S., Chicago, Ill.

IN a broad approach to the management of periodontal involvements, we must consider the course of untreated diseases, particularly those that are chronic. As a rule, these conditions are characterized by a repetition of what might be termed a rise or a high point of irritability and a recovery or remission therefrom. Underlying this process is a tendency to get well without treatment. This accounts for the fact that these conditions are constantly overlooked. Thus, when treatment is induced on the recovery side, the miracle of cure follows. On the other hand, treatment induced on the acute side may serve merely to aggravate the case. It is necessary to understand this fact to explain the apparent success of almost any therapeutic measure when induced on the recovery side and the frequent failure of drug therapy on the acute side of the picture. If, in spite of this fact, treatment is continued until the high reactive point is passed, the case tends to recover.

It is generally recognized that on the skin and in the oral and nasal mucous membrane, as well as in the gastro-intestinal mucous membrane, organisms live without further penetration, until some slight trauma, a cold or other injurious agent leads to local inflammation and infection. Thus, the virus, or micro-organism, having once penetrated, meets with further resistance in the form of local inflammation, the intensity of which is usually sufficient to check its further spread. Unless this occurs, a typical picture of the transition of a previously latent organism to full virulence may be established as a result of the failure of local resistance of tissues. Hence, it will be seen that the mechanical integrity of the skin or mucous membrane is of the utmost importance, but of equal significance is the fact that, in most cases, the adaptability of the underlying tissue cells can be developed to such a degree that they too offer effective pro-

From the Oral Pathology Department, Northwestern University Dental School.

Read by title before the Section on Periodontia at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 15, 1940.

tection against invading micro-organisms or their toxic byproducts.

In this regard, it is significant that gingival crevices seldom have an intact epithelial cover. As a result, differences in the reactivity of the epithelium lining the soft tissue side of the crevice seem to determine, in a large measure, the liability to gingival and periodontal involvement. Under the foregoing conditions, the bacteria or their toxic elements constantly seep through to produce low-grade inflammatory processes in the

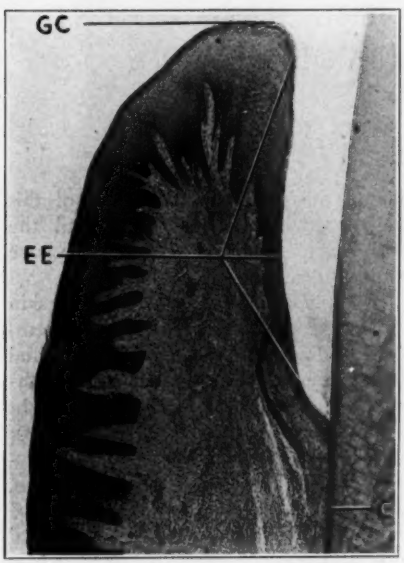

Fig. 1.—Case of patient aged 14. The gingival crest (GC) is well up around the crown of the tooth. EE, epithelium along enamel of crown.

underlying connective tissues. Such inflammatory reactions are not intense enough, as a rule, to prevent further involvement of the supporting structures of the teeth. The ever-present plasma cells attest to this fact. Therefore, the connective tissues underlying the epithelium do not offer effective protection against microbe or toxic irritation and, as a result, the condition continues to be slowly progressive and is therefore usually overlooked. Obviously, then, the elimination of the gingival crevice or the production of an intact epithelial lining on the soft tissue side of the crevice with a sound underlying connective tissue base is in order. This paper deals largely with the former.

The management of pathologic involvement of the periodontal tissues commonly called pyorrhea should be predicated on the proposition that the soft tissue normally changes its position from the crown of the tooth to the root of the tooth with age. The fact that the tooth also tends to change its position in more than one direction should, likewise, not be overlooked. Hence, treatment based on a fixed line of attachment

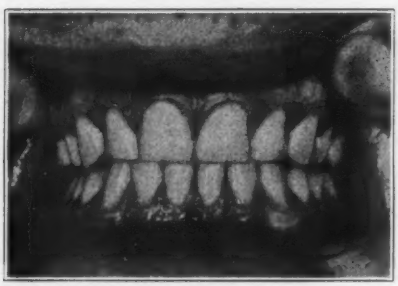

Fig. 2.—Case of young person. The clinical picture corresponds to the microscopic section in Figure 1. The soft tissues are well up around the crown of the tooth.

is untenable. Neither should we disregard the fact that the foregoing conditions, when complicated by injuries either mechanical or chemical, including physical and infective, to the supporting tissues, tend to the development of a gingival crevice. Nor should we ignore the fact that as long as the crevice exists, a chronic disease process is present.

If the normal changes with age, a physiologic approach to the problem must take cognizance of that fact. Hence, it will be seen that if the gingivae, which, it may be presumed, under normal conditions have an intact epithelial cover, have

been damaged, say by mechanical, chemical or physical means, repeated whenever the teeth and their supporting tissues are used in mastication, gingivitis may result. One of the cardinal symptoms of inflammation is swelling which, involving the gingivae, results in overdevelopment of the gingival contour, increasing whatever depth the gingival crevice may have attained at that particular time. Such a crevice seldom, if ever, has an intact epithelial cover, regardless of Nature's attempt to increase the thickness of the crevicular epithelium. (Fig. 5.)

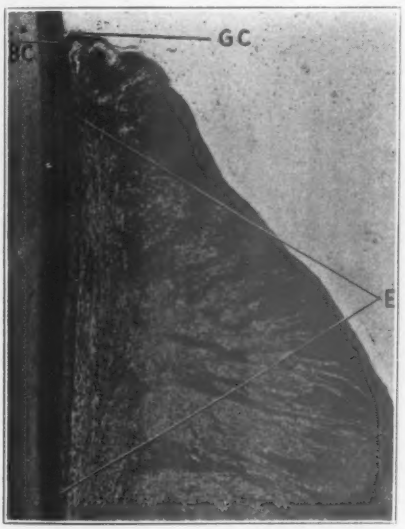

Fig. 3.—Case of patient aged 50. The gingival crest (GC) coincides with the bottom of the crevice, or point of attachment to the tooth, BC. E, epithelium along cementum of root.

Attention should be directed to the fact that all epithelial dissolution is not in the form of an ulcerous necrosis as is commonly supposed. This implies the possibility of a more or less continuous reinfection as long as the crevice exists. The epithelial barrier between the bacterial colony and the adjacent connective tissues undergoes regressive changes as a result of penetration of bacteria or the diffusion of products of bacterial growth. Unfortunately, this is not the only factor in the development of the chronic condition known as chronic periodontitis. The detached soft tissue, as it is buffeted about in the act of mastication, is also subject to a persistent, although slight, trauma, for the reason that the soft connective tissue base of the gingivae no longer resists deformation, the periodontal membrane having been replaced by an infiltration of small round-cell lymphocytes among ever-increasing numbers of plasma cells, and therefore it does not recover its original shape and size. If it were not for this fact, healing might occur even in the presence of infection. For instance, one

Fig. 4.—Case of patient aged 50. The clinical picture corresponds to the microscopic section in Figure 3. There was normal adjustment to detachment without treatment. Physiologic resorption and recession have occurred, leaving no gingival crevice or pocket.

bites one's tongue, and the tongue heals as a result of discontinuance of the trauma.

It is obvious that a gingival crevice increases in depth for the foregoing reasons as well as because the epithelial attachment and the bottom of the pocket may change their position in an apical direction more rapidly than is normal when an inflammatory process is present or because of their own inherent characteristics, while the crest of the gingivae, because it is inflamed, deformed and

swollen, does not. The result is a deeper crevice filled with desquamated epithelium, débris and largely saprophytic micro-organisms. The crevice then consists of the contaminated cementum of the tooth root, on the one hand, and the soft tissue with its incomplete epithelial cover on the other.

These facts taken together readily explain the presence of the leukocytes and the round-cell infiltration as well as

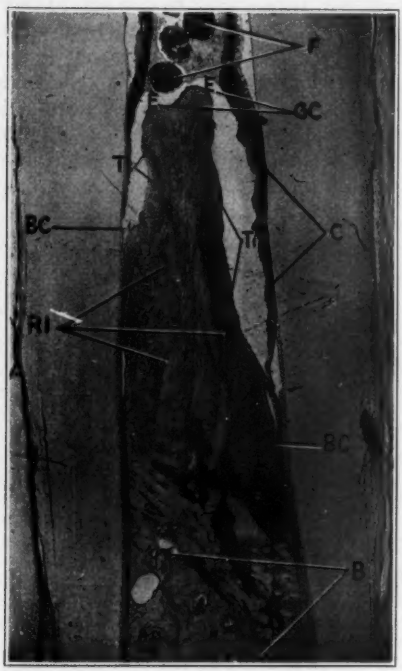

Fig. 5.—Typical idiopathic pyorrhea, with food débris superimposed. C, calculus. T_1, thin epithelial cover of detached soft tissue. T_2, thicker epithelial cover of detached soft tissues. GC, gingival crests. Rl, round-cell infiltration. F, food débris. BC, bottom of pocket. B, bone crest, which takes same contour as respective crevices.

the abundance of plasma cells in the adjoining connective tissue as a reaction to the ingress of bacteria or their toxic products. Under such conditions, restoration of the gingival tissue to its normal form and contour is out of the question. No one has any doubt that constitutional debility of the patient would affect the progress of these gingival pathologic involvements. Many of the conditions suggested as general causes fail to produce the particular localized lesion just described. It is known, of course, that a lack of vitamin C results in scurvy and that one symptom of this disease is gingivitis. Gingivitis can also be produced in unclean mouths by the ingestion of metallic poisons such as bismuth and mercury.

These conditions are specific types of gingivitis which yield, in the one case,

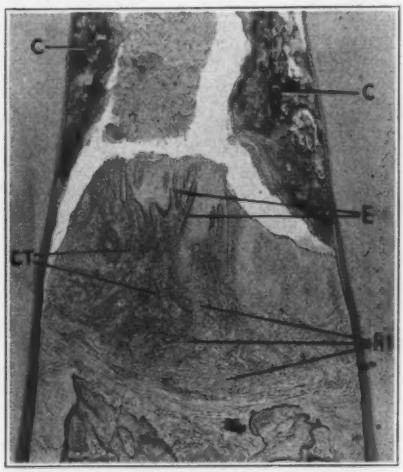

Fig. 6.—Mesiodistal section between adjoining teeth. C, calculus deposits. CT, subepithelial connective tissues. Rl, round-cell infiltration. There is almost a total lack of epithelial cover.

to the addition of vitamin C and, in the other, to elimination of the metallic poisons, and they do not, therefore, explain the low-grade, slowly progressive gingival injuries which, even in the absence of the above-described conditions, result in the development of the periodontal pocket.

Disordered function of the parathyroids has been considered responsible for pathologic lesions of the connective tissue

underlying the incomplete epithelial cover of the soft tissue side of the pocket; while elsewhere in the body exist masses of exactly similar tissue not so involved. Again, the existence of the gingival crevice is the best explanation of the round-cell infiltration.

Also a lack of vitamin A is supposed to affect the crevicular epithelium, while the epithelial cover tissue elsewhere over the body is not so involved. It seems that it is the character of the epithelium and the underlying connective tissue base of the mucous membrane lining the crevice or pocket that determines the liability to periodontal involvement. One cannot fail to realize, then, the importance of the crevice or pocket.

On the other hand, many gingival lesions associated with systemic disease are medical and dental problems, which should be discoverable by the dentist. For example, a gingivitis which exhibits tiny polyp-like growths of granulation tissue protruding from the gingival crevices, and more particularly if associated with an acetone breath, should cause the dentist to suspect diabetes. His treatment should be predicated on the progress that occurs under proper medical management. When properly under control, the soft tissue side of the pocket is best eliminated by surgical measures because of the extent of the involvement and the more exacting control that is possible.

In gingival lesions associated with mouth breathing, often a rather severe inflammatory reaction characterized by red swelling confined to only the labial gingivae of the anterior teeth is noted. As a rule, some deposits are found in the labial crevices. Usually, however, they are not of sufficient amount to explain the extensive gingival involvement.

Correction of mouth breathing by a nasal operation, together with the establishment of mouth hygiene, will, with age, usually result in a cure.

A proliferative type of gingivitis often found in children or youths is frequently characterized by an excess of fibrous connective tissue, which tends to persist even though the inflammatory process subsides after the elimination of mechanical irritants, with suitable instrumentation.

A chronic Vincent's gingivitis is often followed by hyperplasia. In both of these conditions, after the active inflammatory processes are controlled, the fibrous tissues may be eliminated by either electrocoagulation or surgical measures. Here again, the surgical approach is to be preferred for the reason that, if the wound is properly protected, there is no discomfort or pain such as fre-

Fig. 7.—Clinical picture corresponding to microscopic section depicted in Figure 6. The gingival tissue is inflamed and the thin epithelial cover will readily bleed when touched.

Fig. 8.—Case presented in Figure 7; after prophylaxis. The gingival tissue receded as inflammation subsided. With the use of the interdental stimulator, it takes on a deflecting contour with a healthy epithelial cover and a sound connective tissue base below. (Compare Figs. 3 and 4.)

quently accompanies electrocoagulation.

Idiopathic hyperplasia is also best managed by operation even if more than one attempt to remove a hyperplastic growth is necessary. These examples should be sufficient to show that the gingival lesion, in whatever form presented, does not necessarily terminate when the medical side of the problem has been recognized and corrected. The problem of a persisting gingival crevice or pocket, with the consequences thereof, will still have to be met.

It is conceivable that correcting diet deficiences and eliminating metallic poi-

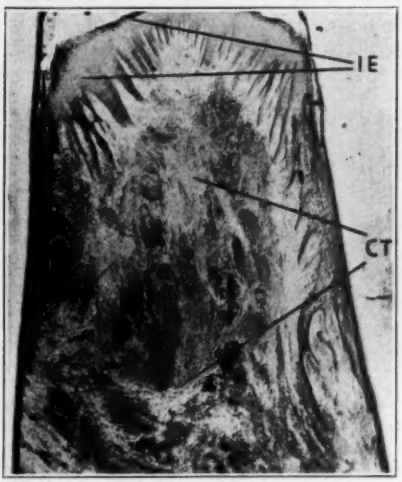

Fig. 9.—Mesiodistal section between upper first and second bicuspid; biopsy ten days after prophylaxis. IE, new intact epithelial cover. CT, connective tissues nearly free of round-cell infiltration.

sons, if present, will aid in a hygienic approach to the problem as far as shallow crevices or pockets are concerned. The deep pocket is quite another problem. The very fact that the epithelium in untreated cases is seldom, if ever, intact and that, in these cases, the underlying connective tissue consists largely of small round cells, lymphocytes and plasma cells, which persist, certainly calls for more effective treatment than the mere cleansing of the surface epithelial lining of the soft tissue and of the cementum surface of the root.

The adjustments to be made as far as the hard tissue side of the pocket is concerned deal with equilibration to provide what a considerable group of dentists choose to call normal functional occlusion. In the presence of a tendency of the teeth to drift in more than one direction when supporting tissues cannot hold them solidly in place, so that natural grinding processes reduce intercuspal leverage on the teeth, dentists compensate by grinding.

On removal of hard concretions on the root surface to eliminate irritation of the adjoining detached soft tissues, which,

Fig. 10.—Clinical picture of acute ulcerous gingivitis. When it is finally brought under control, it should simulate the cases presented in Figures 4, 8 and 15 D.

of course, is equivalent to cleansing the crevice, the adjoining soft tissues may again be covered with a normal epithelium. The presence of a new epithelial cover over the gingiva precludes reinfection of the underlying connective tissue. (Fig. 9.) Continued cleanliness of the crevice allows the inflammation to subside in the gingival tissues, and the tooth may again become tight and comfortable in mastication. Thus, we control an inflammatory process by treatment. The investing tissues resume their normal condition on the basis of a dense supporting structure, which, because of the repeated

inflammatory injuries it has been subjected to and has recovered from, is also reduced in amount. (Figs. 6, 7, 8 and 9.) This, of course, reduces the depth of the crevice and makes control more effective. If the process is repeated again and again, it can terminate only if control of the inflammatory processes is effective through physiologic resorption and recession of the supporting structures, so often seen in middle-aged or elderly people. (Figs. 3 and 4.) The normal functional occlusion has been provided according to the conception of a large group of dentists, and the crevices have been cleaned as above described, a pocket will continue to develop, perhaps because the pocket was too deep when such measures were instituted. Other means of management are still available.

The pathologic conditions resulting from the presence of the gingival crevices, particularly a pocket which involves as much as half the length of tooth root,

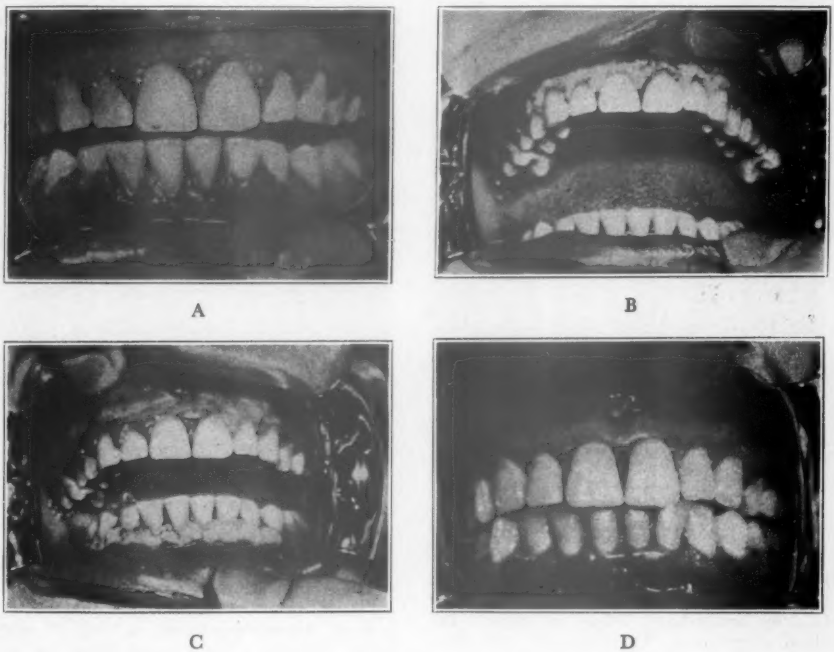

Fig. 11.—Clinical picture of pocket elimination by electrocoagulation. A, case of hyperplastic gingivitis before electrocoagulation. B, case after electrocoagulation (gingival tissues of upper anterior teeth). C, case after electrocoagulation (gingival tissues of lower anterior teeth). D, ten days later. The coagulated tissues have sloughed off and there is a zero crevice covered by epithelium. The case is now ready for interdental stimulation to maintain the zero crevice and the deflecting contour of the normal gingivae. (Compare Figs. 3, 4, 8, 15 D.)

only other approach possible in dealing with the hard tissue side of the pocket is elimination of the tooth. This, of course, has been the vogue when the above-mentioned approaches have failed.

Now, it may happen that even when often may in themselves be responsible for the changed position and looseness of the involved teeth, and they should therefore be considered separately from those associated with variable degrees of stress.

In this connection, I should like to call your attention to the unfortunate ideology built up around the term "diffuse bone atrophy." This term, devised by Gottlieb[1] and popularized by his co-workers and followers, is being used by them[2] to describe what has generally come to be looked upon as a hopeless condition when coupled with pyorrhea. It was predicated on the proposition that cementum probably loses some of its physiologic powers, and, accordingly, what was done in treatment was bound to end in failure.

Cementum probably never had such powers in the first place, if, as Black,[4] Noyes[5] and others have described it, it is a passive tissue, lacking a blood and nerve supply and, for this reason, its physiologic activity is dependent on the surrounding connective tissues which contain these elements. The investing tissues may and undoubtedly do have in themselves the property of determining whether the tooth is to survive. Skillen and I[6] conducted replantation experiments which seem to substantiate this in that, in all repair processes, the tooth participated only passively in the act, supplying possibly only calcium salts for repair after the osteoclasts in the surrounding medium had resorbed portions of the tooth root. All the rest of the repair was accomplished by the surrounding connective tissues. Undoubtedly, however, the functional need for the tooth probably does have some effect in initiating these processes, as Gottlieb and Orban[7] imply.

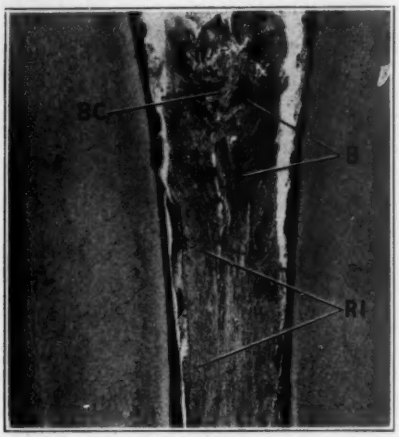

Fig. 12.—Mesiodistal section between adjoining teeth, showing immediate effects of electrocoagulation. (Compare Fig. 11 B and C.) B, hemorrhagic effect in tissue. BC, blood coagulation. RI, round-cell infiltration.

In those distinctly localized pockets which tend to progress in a direction parallel to the long axis of the tooth, the definitely localized osteitis is in no wise diffuse. As related to these conditions, the term "diffuse" is a misnomer. These local isolated areas may become diseased on their own account, independently of general systemic conditions, and they might, therefore, properly be character-

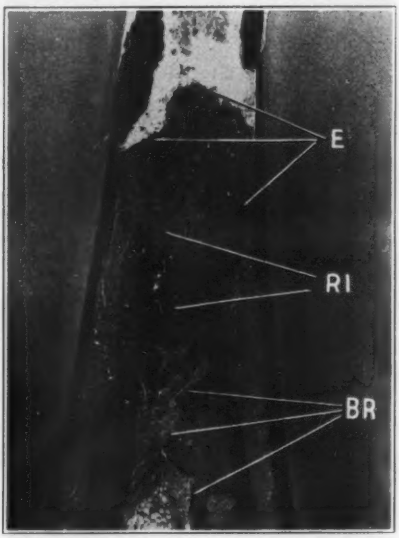

Fig. 13.—Mesiodistal section, showing effects of electrocoagulation in case of sixty hours' duration. The gingival tissue has necrosed and sloughed away, a zero crevice remaining. E, incomplete epithelial cover. RI, active round-cell infiltration. BR, active bone resorption.

ized under the head of idiopathic pyorrhea. This would and could allow for the local idiopathic tooth and bone resorption noted, if indeed it has anything to do with the development of the periodontal pocket. Hence, it will be seen that we are probably not viewing a difference of kind, but one possibly of time or degree or both, and we are, therefore, dealing with a true chronic suppurative periodontitis or, if you like, an idiopathic pyorrhea.

It is obvious that the correction of systemic debility can result only in a general improvement in body tone, which may, of course, affect the local area to some extent, but will not, as a result, eliminate the pocket. On the other hand, systemic improvement may result in definite amelioration of a marginal gingivitis, including the effects of correcting a diet deficiency, metallic poisoning, a blood dyscrasia, etc. In those cases, the lesion is certainly more diffuse in that the gingivae and the underlying connective tissues are uniformly involved around all the teeth and hence do not present the isolated deep pockets that are supposed to be characteristic of so-called diffuse bone atrophy.

However, even in these uniformly involved marginal gingivitis cases, the gingivae may be so irritated that the chronic suppurative periodontal conditions already discussed will ensue.

In treatment, of course, it is ridiculous to require of a patient that he clean either the hard or soft tissue side of the periodontal pocket. The inflamed, deformed, swollen, detached gum margin prevents access to the region. Such an area can be kept clean only when it is made accessible, and it can be readily made so by the elimination of the soft tissue side of the pocket.

The adjustments concerning the soft tissue side of the periodontal pocket deal with processes whereby the crest of the gingivae, regardless of the type of injury to which it is subjected (Fig. 10), is transferred to the point of attachment of the soft tissue, so that the epithelium joins the tooth at a natural angle for deflecting food particles without injury to the gingiva. (Fig. 4.)

Attention is directed to the fact that Nature selects this method of management in the natural recession picture exhibited in middle-aged and elderly people. (Figs. 3 and 4.) In these cases, the gingivae have receded, perhaps a little more rapidly than the bottom of the pocket, and the pocket has been reduced to a zero or near zero crevice.

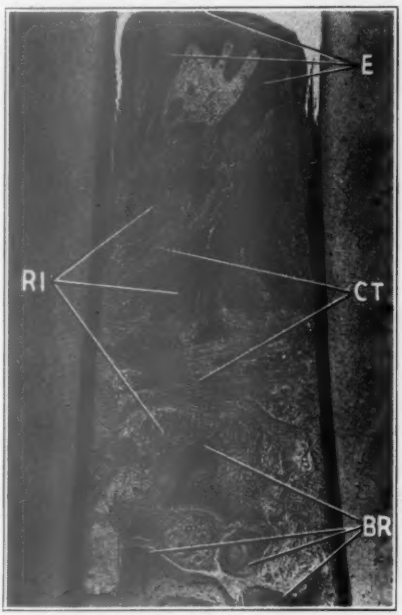

Fig. 14.—Mesiodistal section showing effects of electrocoagulation in case of five weeks' duration. The clinical picture illustrated in Figure 11 D represents this condition quite closely except that this case is a little further along in that the epithelial cover (E) is thicker. CT, RI, decreased round-cell infiltration, which, of course, cannot be seen clinically. BR, greater regeneration of bone.

Zero or near zero crevices, with suitable deflecting contours, can be obtained

in many adult mouths with shallow pockets from 1 to 2 and occasionally 3 mm. in depth, by the simple expedient of removing the deposits on the surface of the tooth root, as has been described. (Figs. 6, 7, 8 and 9.)

As a result of such treatment, just as long as the epithelium remains intact and the tone of the underlying connective tissue is maintained, reinfection does not occur and the chronic characteristics of the disease process terminate. Control is obtained.

If pockets are somewhat deeper after gross scaling of all the teeth, wisps of cotton that have been wound around a peridental membrane explorer and then dipped in an 8 per cent solution of zinc chloride can be packed in each labial, buccal and lingual crevice. Similar dressings can be packed against the septal gingivae, the contact point being used as a wedge, so that the gingival crests are definitely compressed.

This procedure, on removal of the zinc chloride packs, helps to uncover other deposits farther down the root. When the foregoing requirements have been satisfied, an intact epithelial cover develops over the soft tissue and interdental stimulation will help to cause shrinkage of the tissue rather than absorption of the products of inflammation and a possible reinoculation of the

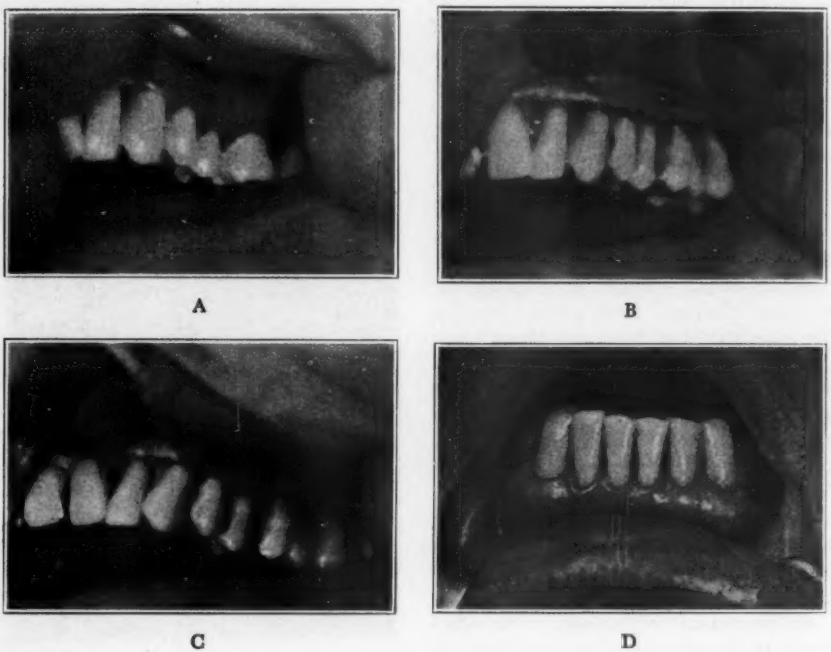

Fig. 15.—Clinical picture of complete surgical gingivectomy in patient aged 35. A, region extending from left central incisor to left second molar. The teeth had been scaled, cleaned and polished so that the inflammation was considerably reduced. The better tissue tone at the time of operation makes for more effective anesthesia, less pain and prompt healing. B, case immediately after operation. C, same case two weeks after operation. At this time, the new epithelial cover was so firm that vigorous brushing with a medium coarse toothbrush caused neither discomfort nor the slightest hemorrhage. D, another case ten years after gingivectomy. This is not unlike Figures 3 and 4.

tissues. Such a procedure eliminates a considerable number of pockets 3 mm. deep.

Electrocoagulation for the elimination of gingival crevices or pockets should not be attempted until the deposits have been removed from the root surface of teeth, in order that the inflammatory reaction to such an irritant will have time to clear up; which usually occurs in from four to seven days. If this procedure is followed, anesthesia is more satisfactory, and healing occurs more regularly and certainly with less pain.

As a result, cases which, in the active inflammatory state, seemed to call for electrocoagulation will not require such treatment. A diagnosis to determine whether electrocoagulation is indicated for pocket elimination should not be made until the foregoing requirements have been satisfied.

Tissues coagulated in the pocket region become necrotic (Fig. 11 A, B, C, D), the severity of the procedure being just short of that of actual cautery. (Fig. 12.) The coagulated tissue sloughs off in from forty-eight to sixty hours. (Fig. 13.) By the end of a week, a new epithelial cover has developed. However, the underlying connective tissue participates actively in the process, which is characterized by rapid round-cell infiltration. In the next few weeks, there is active bone resorption, with progressive regeneration in from three to five weeks. (Fig. 14.) Certainly the tissues have been reactivated; which is seemingly the object of all treatment. Especially is this true in these low-grade chronic conditions. At the end of four or five weeks, if the pocket has not been entirely eliminated, the process can be repeated. Thereafter, interdental stimulation and proper brushing should be employed to maintain the zero or near zero crevice with a natural contour for deflecting food particles, to avoid further injury.

A B

Figure 16.—A, clinical picture of case after prophylaxis and before operation. On the left side, complete surgical gingivectomy was to be performed; on the right, gingivectomy combined with the silver nitrate method. B, healing process after six weeks. The results of one operation cannot be distinguished from those of the other. One obviously is no more conservative than the other. Interdental stimulation has been used here, commencing ten days after operation. An increase in labiolingual width of the septal gingivae over the lower jaw delays somewhat the development of deflecting contours, as shown in Figures 3 and 4 and 15 D.

In the surgical elimination of the soft tissue side of the periodontal pocket, any one of three commonly used procedures can be employed. The first method consists of the excision of the soft tissue side of the periodontal pocket and the elimination of the inflammatory granulation tissue overlying the bone. (Fig. 15, A, B, C, D.) When the procedure is completed, the region operated upon can be

covered by wax or zinc oxide dressings. This operation can be defined as complete surgical gingivectomy.

With the second method, the gingival pocket is also excised, but without any attempt to eliminate the remaining inflammatory granulation tissue overlying the bone. It is treated instead by the application of fused silver nitrate crystals directly to its surface. This is done to prevent the excessive overgrowth of such inflammatory granulation tissue and to encourage the epithelium, from the labial, buccal or lingual surfaces, to proliferate over it. In the management of these conditions, several such applications may be necessary. The cut treated surface may then be covered by wax or zinc oxide dressings. (Fig. 16, A and B.)

The third method is known as the modified flap operation. In this case, the interdental gingivae are separated by a horizontal incision through the center, made by means of a narrow-bladed knife, in either the mesial or the distal direction to divide the septal gingivae into labial, buccal or lingual mucoperiosteal flaps. These, in turn, are reflected so that the inflammatory tissue is fully exposed to view. Such inflammatory granulation tissue overlying the bone may be removed by curets and small shears or small operative dentistry chisels. After free irrigation with a physiologic solution of sodium chloride, the flaps are coapted and the wound is closed by sutures through the flaps in a labiolingual or buccolingual direction. The wound can then be pro-

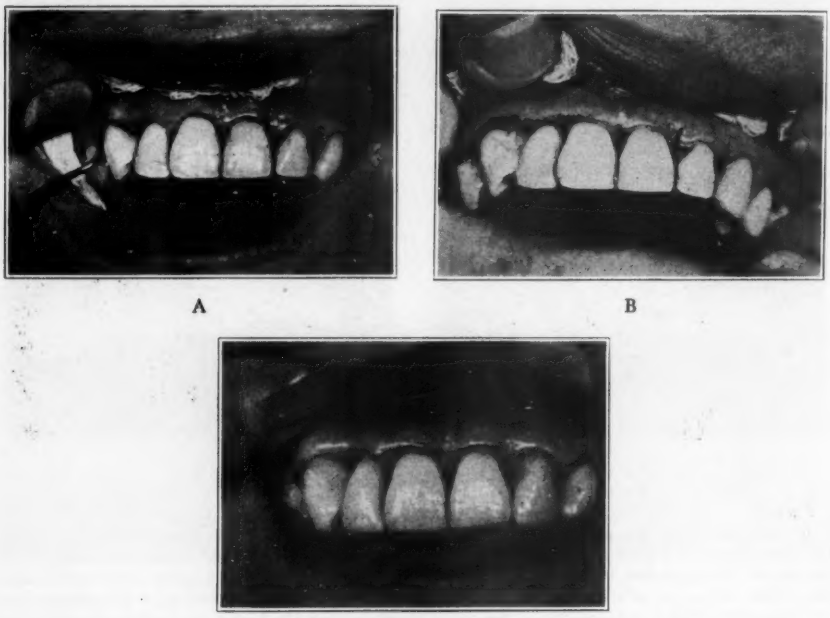

Fig. 17.—Clinical picture of case in which prophylaxis in itself did not succeed in eliminating pocket. A, before complete gingivectomy on the right side and modified flap operation on the left. B, case when respective operations had been completed. C, six weeks later, regions where pockets were of comparable depth in the left and right lateral regions and between central incisors. Again, one is no more conservative than the other. The end-results are the same.

tected by wax or surgical zinc oxide cement. (Fig. 17, A, B, C.)

With any of these methods, the soft tissue of the periodontal pocket can be eliminated. Both complete surgical gingivectomy and the flap operation will require less postoperative treatment than the combined surgical and silver nitrate method, which does not contemplate surgical elimination of the inflammatory granulation tissue overlying the bone. However, in the average case as treated by dentists, the end-result is approximately the same when any one of the methods is used. (Figs. 15, 16 and 17.)

After the soft tissue side of the periodontal pocket has been eliminated by the complete surgical method and a healing period of one month has passed, the condition is as shown in Figures 18 and 19.

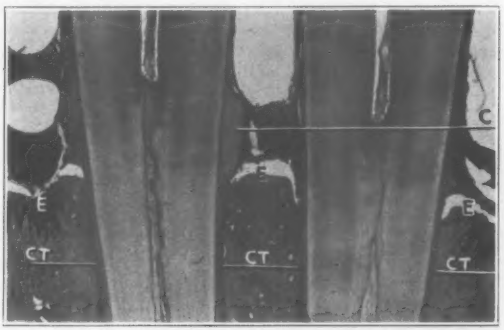

Fig. 18.—Interproximal gingivae; one-month healing period. CT, connective tissue free from inflammation. E, epithelium over crest of gingivae and epithelial attachment relatively thick. C, cementum. Crevices are absent or relatively shallow.

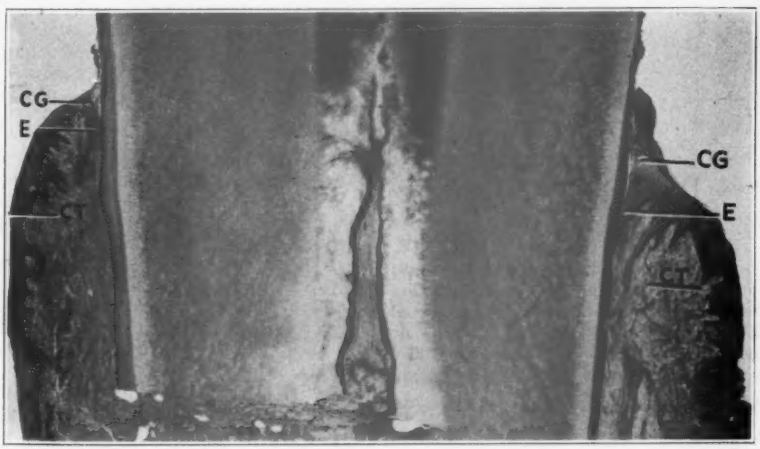

Fig. 19.—Labial and lingual gingivae; one-month healing period. CG, crest of gingiva. E, well-developed epithelial attachment and no crevices. CT, non-inflammatory connective tissue.

The interproximal areas are shown in Figure 18 and the labial and lingual areas in Figure 19. The connective tissues are free of any signs of inflammation. The gingival crevices are so nearly zero that

they are practically non-existent. The epithelial cover of the tissues is intact and is of sufficient thickness and of such character that the underlying connective tissues are amply protected.

Figure 20 shows a labiolingual section of a lower cuspid, illustrating the healing process three months after gingivectomy. It will be noted that an excellent replica of a normal gingiva has been formed, including connective tissue projections

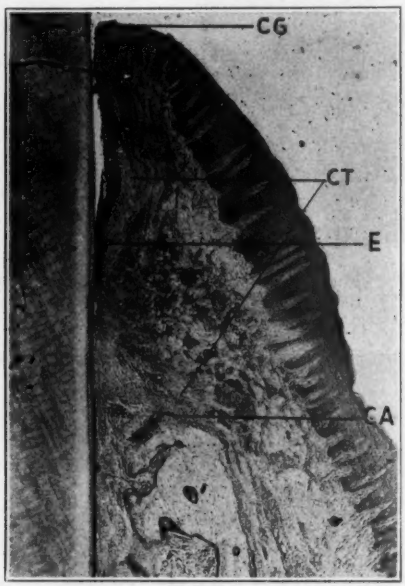

Fig. 20.—Labial gingiva; three-month healing period. CG, crest of gingiva. E, epithelial attachment. CT, connective tissue almost free of round-cell infiltration. The use of interdental stimulation probably could have prevented development of even this amount. CA, crest of alveolar process.

into the thick epithelial covering and the reflection of the epithelium into the gingival crevice, which at this time was 1 mm. in depth. A slight epithelial proliferation attached to the cementum is noticeable along the root of the tooth. The underlying connective tissue is practically free of inflammatory elements. A group of peridental fibers, a replica of the normal gingival group, have grown into the new gingiva and help to maintain it in close adaptation to the root. They also aid in the maintenance in the thin edge of the crest. Just below this group, the alveolar crest group is definitely demonstrable. In Figure 1, the gingivae are related to the enamel, while, in Figure 20, they are related to the cementum.

Obviously, this new gingiva which developed subsequently to a gingivectomy is capable of performing the same functions as a normal gingiva in protecting the underlying connective tissues. It follows that this new gingiva should be rubbed and stimulated every day to maintain its normal deflecting contour and health (Figs. 3 and 4), else a new pocket may develop with its many pathologic sequences.

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DENTAL EDUCATION IN THE PUBLIC INTEREST

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I

IT was a great pleasure to accept the invitation to participate in this meeting, not only because of my long-continued interest in dental education, but also because of my enjoyment in cooperating with dentists in their endeavors to improve oral health service and to extend its benefits. In the title of this paper, the words "in the public interest" have been used to suggest that dental education should be planned not only to produce competent practitioners of dentistry, but also to promote a system of dental health care that will serve effectively the entire population. Before my manuscript was prepared, I was informed that questions suggested by my comment would be asked by the audience and referred to the men now seated on the platform for immediate extemporaneous response. To facilitate this procedure, I shall refer only to basic conditions that affect the objectives of dental education, and thus suggest questions related to procedures and to further progress.

The present era is one of the most dynamic periods in history. Influences that are beneficent, and forces that are malevolent, are contending for mastery in world affairs. Intently alert to the import of these conflicts, we hope to avoid war and its agonies and to promote peace and its blessings. In every important relationship in this country, restudy of fundamentals, search for wider or more direct avenues for advancement and endeavors to increase the general welfare are among the active factors in current, normal, democratic, social evolution. The health service professions are included in these close public examinations. In the ensuing discussions, proposed ways and means to provide health care range all the way from emphasis upon the extent of its distribution regardless of its quality, to insistence upon its quality without regard for the scope of its distribution. Obviously, in this relation, the health service professions and the public should have the same ideal: to bring about universal distribution of all types of health care of the highest quality. The socio-economic difficulties in the way of attainment of this ideal, in each division of health service, are impressive. In the division of dental health care, perplexities are multiplying and problems are crowding forward for solution. Dental education cannot be advanced farther without due regard for these conditions.

What can be said of the present relative usefulness of dental education? In the United States, it is now being promoted by thirty-nine schools of dentistry, nearly all of which are integral parts of universities and none of which is proprietary. The efficiency of dental education in this country has been steadily increasing. In no other nation has it attained greater merit. To its general effectiveness, the most reliable witness, through the longest period, was Charles W. Eliot, whose informed observations for seventy years extended as far back as the fifteenth year after the establish-

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ment of the first dental school, in 1840. Fifteen years ago, as president emeritus of Harvard University, Eliot commented in part as follows:

> I want to congratulate you on the greatly improved standing of the dental profession among the professions. That is one of the most striking changes in public opinion that I have witnessed during my seventy years of observation of educational progress. . . . I do not think I have seen during my seventy years of observation of the professions and the means of training them any change so great as that which has taken place in regard to the dental profession, and to the means of training dentists. . . . The training a dentist needs is in large part a training in skill of eye and hand. It happens that in acquiring the skill he needs he must learn to perform with a high degree of skill a great variety of manual and bodily labor. . . . I believe this School [Harvard] acts on the belief that if a young man cannot acquire the necessary skill of eye and hand, then he cannot become a good dentist. . . . Look forward, therefore, to the future of your profession with great hope.[1]

This comment on the importance of skill and labor in dental practice, by an eminent leader in education, is a significant statement relating to dental education in the public interest. It merits the attention of all who believe that dentistry under other auspices could be practiced effectually by suggestion or advice.

II

Regardless of the accredited efficiency of dental education, the favorable conditions under which it is proceeding and a conservative tendency to let well enough alone, many questions affecting the objectives of dental education have been receiving special attention. Of these, two will be discussed:

1. Should not dentistry, to attain its highest development and also its greatest usefulness to the public, be made a specialty of medical practice, and dental education be included in medical education?

2. Should not dentistry be so partitioned, in the public interest, that dental prosthetics would be practiced by technicians, and dental education be changed accordingly?

Probably we are unanimous in believing that every kind of education, however effectual it may seem to be, should be recurrently subjected to the application of standards that test its current usefulness; also, that traditional satisfactions should not be allowed to stand in the way of application of new views and experimental procedures that seem to assure betterment. The following summary of well-known facts about teeth may be a sound basis for a brief discussion of the questions stated above.

III

The teeth perform important mechanical functions in accord with their special structure, but produce nothing that exerts a useful influence elsewhere in the system. No other part of the body sustains the crushing pressures that the teeth normally transmit in mastication. A fully formed permanent human tooth is so constituted that *(a)* as an organ, it is very hard and inelastic; *(b)* its main bulk is composed chiefly of inorganic materials in compact mineralogic configurations; *(c)* its protective enamel contains neither active nucleated cells nor enzymes, and is not a "vital" tissue; *(d)* its solid body is deficient in blood capillaries and lymph channels for rapid circulation and exchange of chemical units of nutrition; and *(e)* thus isolated from active participation in metabolism, these solid parts of the teeth undergo internal changes at a very slow rate, are weak in powers of self-repair and lack capacity for self-replacement. These striking coordinations of high-pressure mechanical functions, dense mineralogic construction, absent or weak metabolic activity and deficiency in physiologic powers of self-repair and self-replacement account for the inability of fully formed

permanent human teeth actively or effectively to repair a traumatic injury, to replace material that may be removed in functional use or to repel bacterial invasion.

These concurrent conditions emphasize the static nature and the mechanical quality of teeth as organs. These conditions also account for the impressive facts that the permanent teeth, owing to the relatively inactive metabolism in their solid portions, *(a)* are more commonly diseased, from early childhood in civilized man, than any other part of the body; *(b)* when diseased, cannot as a rule be cured, even in the periodontal aspects, by therapeutic measures that customarily are effective in the treatment of many other bodily ailments; *(c)* may be extracted without serious detrimental effects on the functions of the jaws or on the general welfare, as far as removal itself is concerned, and *(d)* although artificial substitutes can never perfectly replace normal parts of the body, sanitary substitutes for the exposed hard portions of teeth, individually in whole or part, or collectively, can as a rule be mechanically adapted esthetically for comfortable and effective maintenance of all related dental functions. These anatomic, physiologic, pathologic and restorative conditions have given the teeth a unique relationship in health service, and account for the fact that, owing to the ensuing manifold mechanical requirements in the treatment of dental disorders, there are nearly half as many dentists as physicians in active practice in this country.

IV

The inherent peculiarities of dental conditions, disorders and treatment that were briefly and generally outlined in the foregoing summary have been crucial factors, by a process of natural selection, in the evolution of dental care in the United States. This evolution has been facilitated by the general inattention of physicians to dental conditions. From earliest times, physicians, regarding diseases of the teeth as relatively superficial, temporary and comparatively unimportant, usually have been correspondingly unconcerned about means for the amelioration of dental disorders. This indifference occasioned the gradual development, by craftsmen, of interest and proficiency in the alleviation of dental disabilities by obviously desirable mechanical means. A prolonged trade era of improving dental craftsmanship, of attendant increasing personnel and of growing acceptability of the ensuing reparative and restorative oral service prepared the way for the evolution in understanding and responsibility resulting in the events, one hundred years ago, that completed the foundations for dentistry as an accredited profession.

The conditions that give the teeth a special mechanical quality, in their relation to the body as a whole, offer no present inducement to physicians to acquire proficiency in the control or treatment of dental disorders. The interest of physicians is absorbed in the dynamic, complicated and exigent qualities of the many pathologic conditions that occur in parts of the body other than the mouth. In the modern physician's accustomed view, dental diseases as a rule are relatively static and chiefly local and restricted in influence, and usually do not require immediate attention—additional factors that tend to subordinate oral disorders to many others in *his* perspective.

In this country, few physicians now attempt to perform, or to advise the conduct of, any aspect of dental health service other than some phases of oral surgery or emergency treatment. Disorders of the teeth are reserved for dentists, who treat directly only the teeth and the parts that support and keep the teeth in position. This division of health services accords with the fact that the treatment of most dental diseases and their consequences requires expertness in difficult and exact mechanical procedures, applied

with "mechanical judgment" and "physiologic understanding," which can be performed, within the mouth of the patient, usefully and safely only by persons who have the necessary manipulative skill, and also have received special education in the health service sciences and their dental applications. The mechanistic phases of dental education have not been included in that of physicians for several reasons, among which are these two: 1. Much more time than the curriculum for the M.D. degree may allot is needed for the training that develops expertness in the use of the mechanical dental procedures. 2. These methods are not effectual in the treatment of disorders elsewhere in the body.

These circumstances have given to dental practice a health service responsibility that, in the interest of the patient, demands special understanding and proficiency, which are acquired in the dental schools. Dental faculties are receiving increasingly effective help from associated medical faculties in the instruction of dental students, not only in clinical relationships, but also in the sciences that are fundamental in the professional education of both physicians and dentists. For dental students, the desirable instruction in these health service sciences provides a broad basis for, but does not displace, training in the technical procedures and their applications that are peculiar to intra-oral dental practice.

If I am not mistaken, my comment thus far, as a basis for suggested answers to certain questions, has summarized a few realities on which agreement is practically unanimous. Much of what I am about to add represents opinions, stated directly and positively for the sake of brevity, to be discounted in accordance with your judgment.

V

Occasionally, one hears of gross deficiencies in the service of the individual dentist. Such regrettable instances of unworthiness are common to all professions, including the theologic; and, as a rule, when not due to ignorance, represent perversities of human nature. Every organized profession strives continually to raise its general quality to the highest attainable level. In this respect, organized dentistry, by persistent endeavor, is eliminating unfit dental practitioners and is promoting knowledge, efficiency and professional fidelity throughout the dental profession. I suggest that you recall the import of my quotation from the comment, by Eliot, on the greatly improved standing of dentistry among the professions, and on the growth in public appreciation and esteem of the dental profession, during the past century.

Some critics of the deficiencies of dentistry assert that if dental practice were included in medical practice, dental health care would speedily and automatically attain a perfection that it cannot acquire as the objective of a separately organized profession. This expressed belief represents wishful thinking rather than sound judgment, for it has the obvious demerit of proposing that a profession which has been, and by preference continues to be, inattentive to dental conditions should direct the practice of dentistry. In an examination of the validity of these assumptions, numerous questions such as these arise: Do many physicians show marked concern about the condition of the teeth of, say, their youngest patients, when advisory attention would be particularly helpful for the prevention or early correction of dental disorders? Have physicians been showing notable leadership in encouraging or conducting research in dental relationships? Does the knowledge of dental diseases and their treatment, if recently extended by physicians, promise, by either volume or quality, to revolutionize dental practice? Do medical schools manifest a disposition to give either the prevention or the consequences

of dental ailments serious attention? Several years ago, these statements were published:

(a) One of the many striking examples of current unconcern about dentistry, where physicians have authority to control its affairs, was shown recently by the Medical Faculty of Harvard University. This Faculty issued a volume of 194 pages entitled: *Synopsis of the practice of preventive medicine as applied in the basic medical sciences and clinical instruction at the Harvard Medical School.* Despite the importance of preventing diseases that may originate in the mouth, dentistry and all its medical aspects and correlations were disregarded in this important book. . . . The Harvard Dental School . . . is conducted under the general jurisdiction of the Medical Faculty. The full professors in the Dental School are members of the Medical Faculty.

(b) Specialists in medical practice, unlike dentists, have not been receiving *formal,* systematic, and intensive education for the performance of their particular functions. This situation, which organized medicine is now seeking to improve, indicates what probably would have happened to dentistry *from relative neglect,* if it had been a specialty of medical practice. . . . The best dental schools now provide a professional education that represents the most advanced formal training, as recognized by statute, for the practice of a specialty of "medicine" (health service).[2]

Thus far, efforts to convert dentists into physicians, who would give to dental practice a quality that, it has been alleged, dentists cannot impart, have not been successful. In this relation, the following comment by Dean Frederick B. Noyes is instructive:[3]

The attempts which have been made to broaden the training and viewpoint of technically-trained men, for example, in the Yale experiment, have largely failed, because as soon as the man obtains a medical degree he wants to practice medicine or surgery, and abandons his dental training. This is probably chiefly because of the fact that in acquiring his medical knowledge he has not been given a vision of its application in the practice of dentistry. It may help medicine but it will never help dentistry if the man who obtains a medical degree in addition to his dental degree wants to forget immediately that he was ever called a dentist.

Various available facts strongly indicate, also, that a large percentage of those to whom Dr. Noyes referred were not clearly destined for success in dental practice and wisely sought more congenial opportunities.

The achievements that have given American dentistry international preeminence have resulted in the main from the special attention that oral health service has received in the United States from a well-organized profession specially prepared for dental practice, competent to promote it and intently devoted to its development. In the United States and Canada, dentistry has not been merely a subordinate, casual, incidental or neglected part of medical practice. Fortunately, American physicians, in growing number, in realization of the general correlations of some dental diseases, are inviting dentists to intimate consultations in the interest of the patients. An increasing number of dentists, in turn, with improved understanding of the systemic import of various oral conditions and symptoms, are referring patients directly to physicians for general health service. Increasingly intimate cooperation between individual medical and dental practitioners points the way to desirable future relationships between the two professions and promises to yield cumulative benefits for the public.

VI

My second question referred to the proposed partition of dentistry, by which dental prosthetics would be practiced by technicians. This preference seems to be based on the assumption that, since laboratory technicians make dental substitutes, they could also plan and place them. This proposal appeals to two main groups: *(a)* physicians and dentists who

favor transfer to medical practice of the so-called medical phases of dentistry and *(b)* technicians who desire to practice prosthetic phases of dentistry. Such essential health-conserving procedures as the filling of teeth do not seem to interest either of these two groups. The following statement on prosthodontics, adapted from the comment of a dentist who is eminently able to discuss it, applies to this situation:

After some teeth have been removed, the dental mechanism may undergo unphysiologic changes, such as displacement, excessively rapid abrasion and malocclusion of the remaining teeth. These changes may result in inadequate mastication of food, impairment of speech, premature loss of remaining teeth, disease and resorption of tooth-supporting tissues, shortened facial dimensions, loss of esthetic expression, reduction of salivary secretions, digestive disturbances, neuralgic symptoms in face and head and impairment of the hearing. These possibilities require the early replacement of missing natural teeth with prosthetic substitutes. Oral tissues, like all the others, are subject to changes induced by age and by disease. Crowns, bridges and dentures must be not only accurately made, but also precisely fitted to the remaining teeth and the mucous membrane. Anatomic form, physiologic function and esthetic expression must be faithfully restored. Each prosthetic restoration requires a mouth examination; diagnosis; treatment planning; making, fitting, placing and subsequent adjustment, and periodic examination and correction while the patient wears the prosthesis, to prolong its usefulness and to maintain the oral health of the patient. These procedures cannot be conducted without adequate education, not only in the biologic sciences, such as anatomy, physiology and pathology, but also in related sciences, such as physics, engineering, esthetics and phonetics. The field of prosthodontics is further extended in the treatment of cleft-palate, hearing defects and related disturbances of dental origin and postsurgical anomalies.

Many physicians, and the general public, are apparently unaware of the disabling consequences of inadequate prosthetics in dentistry. If some dentists, through ignorance or indifference, practice dentistry without regard for these health responsibilities, such degradation of oral health care cannot be used, in the public interest, to support the idea that technicians, who are untrained in the health service sciences and in their applications, should be given freedom to practice dental prosthesis. The dental profession should bring the facts in this situation more effectually to public attention.

The work of all dental technicians depends on impressions, models or specifications furnished by dentists. A dental technician, having fabricated a dental bridge, for example, in compliance with a dentist's specifications, must return it to the dentist, who examines, tests and modifies it when necessary, fits it to the abutment teeth in the patient's mouth and corrects the contact relations of the patient's own teeth so that chewing efficiency can be restored, in harmony with the extreme degree of accuracy required by the complex anatomic and physiologic requirements. A dental substitute made from a dentist's specification cannot be fitted as superficially as spectacles may be adjusted by an optician. The substitute must be adjudged mechanically sound, artistically satisfactory, functionally adequate and healthfully safe, by the dentist, who has been educated to meet this responsibility in health service. By helping in a laboratory to make and to adapt dental substitutes, a cooperating technician can greatly increase the amount of time available to a dentist for direct personal service within the mouths of patients; but without the prolonged special education in the sciences and arts now required by law in every

state for the practice of dentistry, the most expert craftsman could not be safely entrusted with the health responsibility of fitting and placing dental substitutes.

Promotion of public welfare requires rejection of the idea that dental prosthetics and the production and fitting of crutches are on the same plane of health care. One of the surest ways to return dentistry speedily to the condition from which it emerged one hundred years ago would be to subject it to such deterioration.

VII

Impending changes, in accord with current social evolution, should not be permitted to impair the quality of any form of health service for the individual patient. Continual betterment of the quality of health care should obviously be a permanent objective of the health service professions. As the scope of health care expands with growing knowledge, multiplying discoveries and extending experiences, the inability of any person to be proficient in more than a very small share of the whole becomes increasingly evident. The absurdity of some current personal vanities among all kinds of "doctors," including professors, suggests that "second childhood" often follows closely the first period of puerility. There should be earnest coordination of understanding, abilities and facilities, including humility, in a common cooperative purpose, among all types of practitioners, to promote the general health. The philosophy of territorial imperialism does not accord with the spirit and objectives of professions that have been entrusted with, and have accepted, the responsibility for ministering to the health of all the people.

From a humanitarian standpoint, it is obvious that all persons should receive adequate dental health care as needed; but since many persons do not receive adequate dental health care because they cannot afford to pay for it, we face the familiar question: What should be done to bring these conflicting conditions into harmony for the general welfare? The solution of this important public problem is the dental profession's responsibility and also its opportunity. Expanding research, to increase the profession's power to prevent or control dental disorders, is a cumulative need; but, while the full fruitage of such efforts in research is awaited, it is evident that plans to provide adequate dental health care for all who need it *when they need it* should be devised and conducted by the dental profession. These plans, without impairment of normal relations with those who can pay the fees of private practice, should be evolved under the auspices of organized dentistry, in fulfilment of its public obligations as a health service profession, in harmony with the profession's expert knowledge of dental health requirements, and, as far as may be necessary, with the support of public resources. It seems equally evident that the public, in appreciation of the fidelity, achievements and success of practitioners of modern dental health care, would wish the resulting plans to be based, in all aspects, squarely on the Golden Rule.

VIII

At the beginning of this paper, two questions of many were selected to serve as a basis for discussion. Another question may suitably engage our attention, briefly, in conclusion:

3. Should not the professional phase in the education of dentists be so conducted that its primary purpose would be the maximum health benefit for the individual dental patient, with due regard also for the self-respect, economic welfare and contentment of the individual practitioner?

Does not this question answer itself in the affirmative? Have I been in error in concluding that the public welfare would not be promoted either *(a)* by

transferring dental practice to medical practice or *(b)* by partitioning dentistry to permit the practice of prosthetic dentistry by technicians? If these conclusions are sound, the continuance and steady improvement of dental practice and dental education, in charge of the separately organized profession which has brought oral health service to its present high level of excellence, and which may be trusted to go on faithfully with that development in the public interest, is a conservative as well as a progressive program.

It seems certain that dentistry, maintained as a separately organized profession, sustained on its adapted system of professional education, steadily improved and more closely affiliated with public health work, with medical practice and with medical education in universities, hospitals and dispensaries, will become the full health service equivalent of the best possible oral specialty of medical practice that might otherwise be instituted. Existing dental leadership is striving earnestly to attain this broad objective. Meanwhile, in North America, dentistry obviously would not be bettered by any new relationships which, by forced requirements or artificial character, would increase the difficulties of dental practice without assuring higher quality in the average practitioner and greater excellence in his service; or which would increase the economic load for either the public or the dental profession, or both.

Graduate dental education, in its many phases, including medical relationships—individual advanced efforts in universities rather than group "courses"—is the natural route to the farthest extensions of dental knowledge and practice that would carry dentistry to its most useful achievements and to the highest professional standing. Graduate study, by an increasing number of dentists who are qualified for dental leadership, in the specialties of practice, research, teaching and public health administration, and in the fields of oral health service that combine most intimately the joint responsibilities of medicine and dentistry, would not only perfect the coordination of dental practice with medical practice in the public interest, but also promote mutual understanding and cooperation between practitioners in the two groups.

As in all other phases of education, opportunities for the further improvement of undergraduate dental education are abundant, and are clearly recognized in the dental schools. Some of these improvements await solution of many current general problems in education. There is urgent need, in the university dental schools, for a greater share of the attention of the president and trustees to the economic requirements of dental education as an agency for instruction, and for graduate study and research, in a division of health service that now affects the welfare of every person, from early childhood to old age. Dental faculties welcome the close cooperation of educational advisers who are competent to indicate useful developments in dental education. These developments should assure, for the dental student, the most desirable cultural opportunities and also adequate understanding of the social obligations and economic responsibilities and limitations of dental practice, without impairment of the training required to give him the ability and readiness to perform faithfully and skilfully all his duties as an intimate personal health servant in dental care.

I am confident that, under the coordinating guidance of the Council on Dental Education, with the active constructive endeavors of the faculties of the dental schools, and with increasing cooperation from associated medical and graduate faculties, dental education in universities will continue to be adapted closely to the public interest. Again reading the last sentence in my earlier quotation from an address by President

Eliot: "Look forward, therefore, to the future of your profession with great hope."

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HEMOSTATIC AGENTS

By JOHN A. HIGGINS, D.D.S., Chicago, Ill.

FOLLOWING the extraction of teeth, there is sometimes prolonged bleeding from the tooth socket. Various methods of treating such conditions have been employed in the past.[1] The simplest method of treatment, although perhaps not the most effective, consists in having a patient bite down on a pledget of cotton, retaining pressure against the affected area for several minutes or longer. Other methods of checking socket hemorrhage involve the use of chemical agents or drugs. These chemical agents or drugs can be divided into those that check hemorrhage by local chemical action and those that check hemorrhage by pharmacologic action.

In the first group, involving chemical action on the blood plasma, the blood tends to coagulate and adhere to the affected area and this checks the bleeding. Chemical agents that might be mentioned in this group are calcium salts, ferric chloride, ferrous subsulfate, febrin ferments, thromboplastic substances and viper venoms.

The second group of chemical agents or drugs used in socket hemorrhage tend to check hemorrhage by constriction of the smaller blood vessels either directly or indirectly through nervous influences. In the latter classification, we might mention pituitary extract, ergot preparations, ephedrine, synephrin, epinephrine (adrenalin chloride) and potassium chloride.

The extract from the posterior pituitary glands of the cow is obtainable either for surgical or for obstetric purposes. The difference relates to concentration or strength, surgical pituitary being the weaker of the two brands. Administration of pituitary extracts causes a contraction of muscular tissue. (Fig. 1.) Ergot, which acts somewhat similarly, is a fungus which grows on rye. It contains the alkaloids ergotoxine and ergotamine as well as the amines tyramine and histamine. These products of ergot act differently on different organs of the body, but when they are combined as in the extract of ergot, the pharmacologic reaction is a contraction of muscular tissue especially of the uterus and blood vessel walls. (Fig. 2.)

Ephedrine[2] is an alkaloid from *Ephedra vulgaris* or the rather common Chinese plant ma huang *(Ephedra equisetina)*. Ephedrine is closely related to epinephrine in chemical structure. A much larger dose or a greater concentration of the drug is necessary to give a rise in blood pressure comparable to a rise in blood pressure produced by administra-

tion of epinephrine. The effect, however, is more lasting. (Fig. 3.) Ephedrine solutions are very stable and can be sterilized by boiling.

Synephrin is a synthetic alkaloid (N. N. R. 1933) and, like epinephrine, it is used as a vasoconstrictor. While the activity of epinephrine is decreased by the addition of hydrogen dioxide or

Fig. 1.—Effect on isolated uterus of guinea-pig of injection of pituitary extract. The first four contractions show a maximum reaction, while the last two contractions show the comparative strength of the two samples of pituitary extract tested.

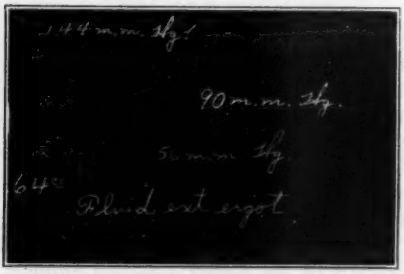

Fig. 2.—Rise in blood pressure of dog following injection of fluid extract of ergot. The primary fall in blood pressure is due to the alcohol content.

through irradiation, synephrin activity can be increased from 10 to 20 times the normal by similar treatment.[3] (Fig. 4.) Synephrin base does not seem to respond to irradiation or treatment with hydrogen dioxide in a manner similar to that of the synephrin salts. An increase in activity of synephrin salts is maintained over a long period of time.

Epinephrine is obtained not only from the suprarenal (adrenal) glands of beef, but from Ch'an su,[4] the dried venom of

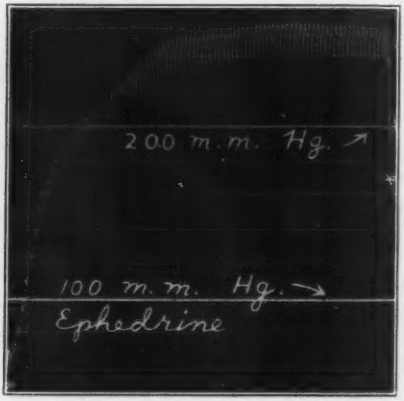

Fig. 3.—Rise in blood pressure of dog following injection of 0.5 cc. ephedrine hydrochloride (1:200 solution). (*Where drum stopped.)

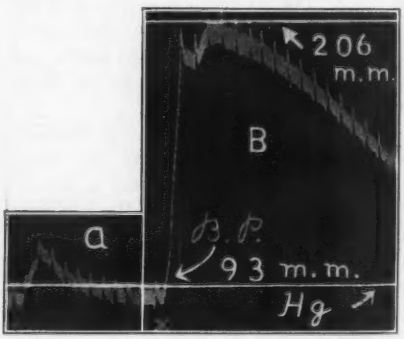

Fig. 4.—Rise in blood pressure of dog following injection of (A) 1 cc. of synephrin hydrochloride 0.1 per cent, and (B) 1 cc. synephrin hydrochloride 0.1 per cent after treatment with hydrogen dioxide.

the Chinese toad. (Fig. 5.) Epinephrine is readily oxidized, and for that reason

it is usually isolated from the glands in a carbon dioxide atmosphere. If it is mixed with sodium bisulfite or sodium hyposulfite, oxidation is retarded. The pressor effect of epinephrine is due to stimulation of the vasoconstrictor nerve endings as well as of the sympathetic nerve endings in many organs of the body. Administration of epinephrine results in a marked and rapid rise in blood pressure due mainly to contraction of the arterioles. This rise in blood pressure is of a short duration. Application of epinephrine locally to blood vessel areas causes constriction of the arterioles, indicating a peripheral action. Potassium salts act somewhat similarly to epinephrine. (Fig. 6.)[5, 6]

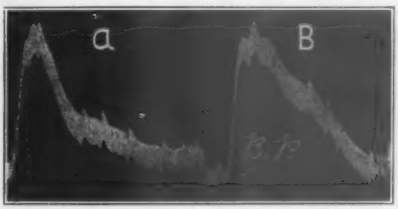

Fig. 5.—Rise in blood pressure of dog produced by injection of (A) 1 cc. (1:50,000) epinephrine obtained from suprarenal glands, and (B) 1 cc. (1:50,000) epinephrine obtained from Ch'an su.

COMMENT

Prolonged bleeding following the extraction of a tooth is a local condition. Whatever agent is employed in the treatment of such cases must come in contact with the affected area and be retained in such a position long enough to prevent any recurrence of bleeding.[7] The oral administering of calcium salts may not give the desired effect unless sufficient vitamin D is incorporated to adequately take care of the calcium salts.[8] At times, a patient may err in constantly rinsing the mouth after dismissal from the dental office. In the case of a hemophilic patient, premedication is no doubt desirable.[1]

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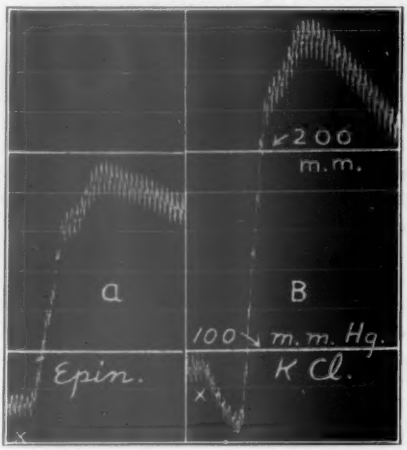

Fig. 6.—Rise in blood pressure of dog following injection of (A) 0.5 cc. epinephrine (1:25,000) and (B) 1.5 cc. potassium chloride (5 per cent solution).

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GNATHOSTATIC DIAGNOSIS OF "DENTURE MUTILATIONS"

By Thomas R. Moore,* D.D.S., St. Louis, Mo.

IT seems to be generally accepted by members of the dental profession that prosthetic dentistry should be divided into two departments: (1) partial denture prosthesis and (2) complete denture prosthesis. There are those who recognize still another division, which they call crown and bridge prosthesis. Each department has developed a method of examination and diagnosis which is best suited to record the local conditions typical of cases in that department. I do not believe that there should be any such division in prosthetic dentistry so far as diagnosis is concerned.

I shall endeavor to show that in prosthetic cases the basic abnormality present (not merely the loss of teeth and adjacent alveolar structure) should be the basis for a diagnosis. By basic abnormality, I mean the condition of the jaws and the relationship of the denture to the head and face. Therefore, there is no need to differentiate between partial and complete denture prosthesis, and, for the purpose of this discussion, the term "denture mutilation" will be used to describe all types of conditions which require prosthetic service.

In a review of the literature, I was unable to find any classification for prosthetic dentistry that would include all types of denture mutilations. However, a great deal has been written concerning examination and diagnosis of intra-oral conditions and a few attempts have been made to classify them.

To illustrate, I shall mention a few of the most popular methods of examination and diagnosis.

One of the oldest classifications is that of Supplee,[1] which is applicable to complete denture prosthesis only. This diagnosis concerns ridge conditions; that is, the edentulous arches are grouped according to size and shape. This classification was advanced as an aid in selecting a suitable impression technic and as such has been very valuable, but, as we shall see, it falls far short of constituting a scientific diagnosis for denture mutilations.

Another classification, originated many years ago, was based on the patient's temperament. In this, the theory was that the size, form and color of the teeth were related to the four basic temperaments. The purpose of this was to aid in the selection of teeth.

The most nearly universally accepted classification is one applicable to partial denture prosthesis only. The basis for this diagnosis is the number of missing teeth and the relation of the edentulous areas to the remaining teeth. It is easy to understand that this diagnosis is of value only in determining the type of appliance to be used.

Still another classification offered was based on the bite or interarch relationship. This diagnosis did not consider the jaws as a part of the face, but, instead, took into consideration only the relation of one jaw to the other.

It can be readily understood from this brief review that methods of diagnosis heretofore offered concern only local conditions of the denture. Not one classi-

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Read at the Mid-Continent Dental Congress, St. Louis, Mo., October 24, 1939.

fication suggests that the denture might be an important part of the face or that any abnormality presents itself except the loss of teeth with the attendant changes in alveolar structure. I do not wish to criticize these methods of diagnosis since I realize that each was intended as an aid to the operator in formulating a treatment plan for one phase of denture construction only.

The true basis for a diagnosis is the kind and degree of mutilation present and the condition of the remaining structures of the denture. Paul W. Simon[2] writes,

> Every classification of organic deformities must definitely answer the following questions: first, what part of the organ is abnormal? second, what kind of deviation do we find? and third, the degree of the deformity? . . . In every instance a clear presentation of the anomaly should ensue; the more accurate the presentation, the more useful it becomes. It is only after such a clear idea is formed in our minds that we gain a true conception of the import of all our diagnostic efforts.

Just why should the kind and degree of mutilation present, as well as the condition of the remaining structures of the denture, form the basis for a diagnosis? The answer is quite simple: Prior to the loss of teeth, every patient presents two basic conditions:

a. The growth and development attained during eruption of the deciduous and the permanent dentures.

b. The relationship of the denture to the face and head of the patient.

The teeth are part of the framework that makes up the facial skeleton. At birth, the denture is without teeth and the face is wide in proportion to height and anteroposterior dimension. With the ap-

Fig. 1.—Equipment for making photognathostatic reproductions.

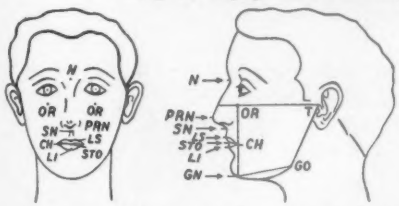

Fig. 2.—Symbols and location of facial measure points.

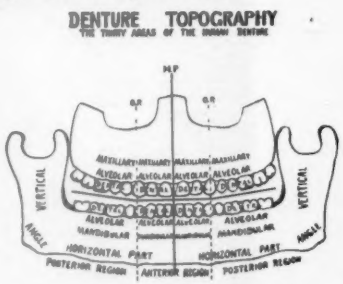

Fig. 3.—Thirty areas described by Simon for denture topography.

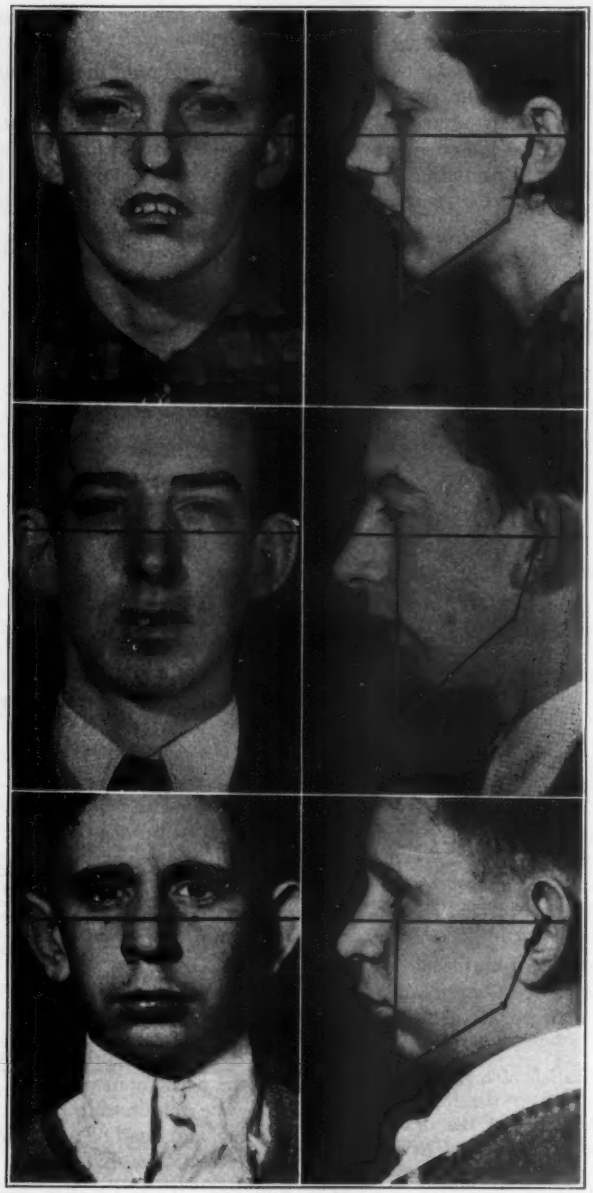

Fig. 4.—Photognathostatic reproductions of total mandibular retraction and maxillary alveolar protraction (above and center) and of total mandibular retraction.

pearance of the teeth, the face shows growth in three planes. This growth, normally, is continuous until adult life. Any interference with this development, however, manifests itself as a deviation from the normal. Once this deviation occurs, the mere loss of teeth will not correct it. On the contrary, the loss of teeth complicates the abnormality. That there is an intimate relationship between the denture and the face during this period of development is best illustrated by the fact that the periods for comparative measurement of the face are determined by the eruption of the deciduous and the permanent teeth.

Nothing need here be said concerning the value of the condition of the remaining structures of the denture in a diagnosis, as that has been the basis for previous diagnostic methods in prosthetic dentistry.

Now, let us see whether this method of diagnosis is applicable to prosthetic dentistry. At least 50 per cent of all human beings have dental anomalies; that is, the growth and development of their dentures were never adequate or normal. Realizing that inadequate growth and development is manifested by abnormalities of the face and the denture, we might expect, and we find it to be

Fig. 5.—Photognathostatic reproductions of mandibular protraction (above) and of edentulous eugnathic case (below).

the case, that a large percentage of this 50 per cent group have extreme deformities involving the face and jaws. Since extensive tooth loss usually comes in adult life or after the period of growth and development, it follows that a considerable number of edentulous or partially edentulous patients present deformities of the face and jaws and their processes which developed prior to the loss of teeth. It would be absurd to believe that the loss of teeth would correct these morphologic abnormalities. Since they must be present in a large number of prosthetic patients, is it not essential that they be recognized and evaluated in diagnosis if we are to arrive at a scientific prognosis?

In addition to these deviations in growth and development, we are confronted with complications arising from the loss of some or all of the teeth. To illustrate, I shall name a few complications: a. Edentulous areas with varying degrees of resorption. b. Changes in the mandibular angle. c. Temporomandibular disturbances. d. Malocclusion of the teeth. e. Changes in facial contour.

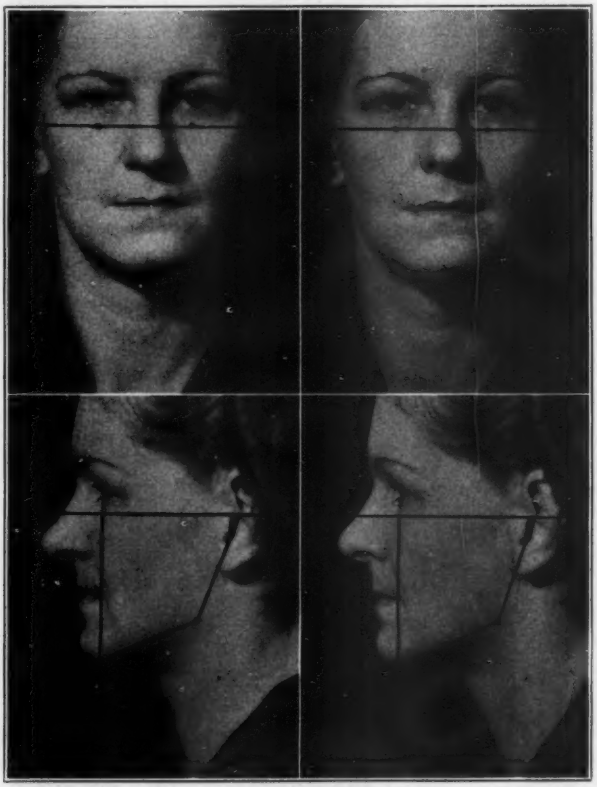

Fig. 6.—Photognathostatic reproductions of eugnathic denture.

Usually, these complications are minor. However, in extreme cases, it is possible that the dentofacial relationships will be disturbed. When this happens, recognition of such abnormality becomes necessary in the diagnosis.

Physical anthropology and photogra-

phy began as sciences the same year that the first dental school was founded in Baltimore (1840). Both of these sciences have undergone rapid development and have accumulated data and methods of procedure which are very valuable to dentistry. Anthropometry, which deals with the measurement of the body, has become an important department of anthropology. In this field of knowledge, the head and face have been studied carefully. As a result of this study, methods of examination and facial measure points have become standardized. Methods in photography have also been adapted to aid us in diagnosing dentofacial deformities, just as roentgenography has been skilfully adapted to dental diagnosis. (Fig. 1.)

From the methods for examination and measurement used in anthropometry, we now recognize a group of measure points on the face that are of great value in diagnosis. Figure 2 shows these measure points and their symbols. The definition of these symbols is as follows:

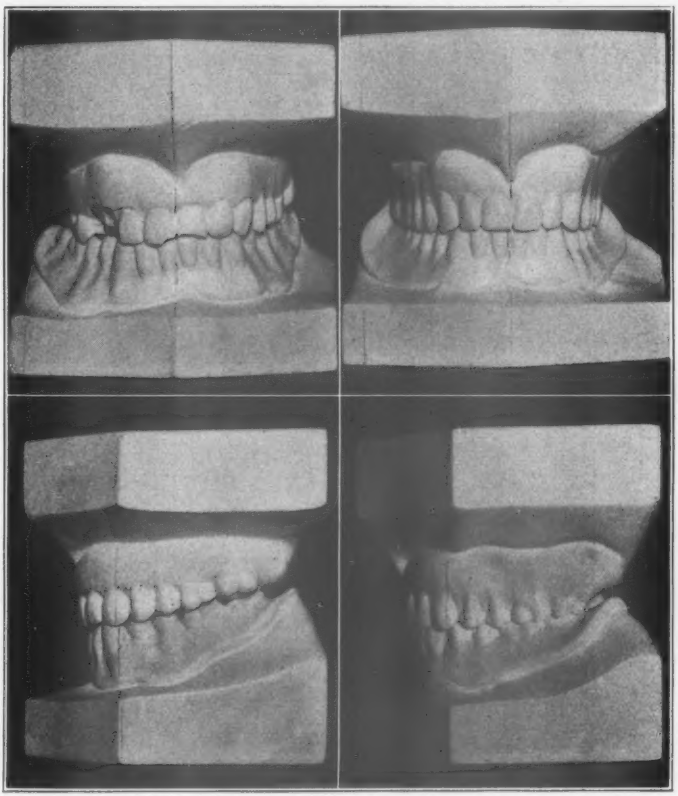

Fig. 7.—Plaster reproductions of dentures for patient in Figure 6.

N. *nasion*—The point at the root of the nose which is intersected by the median sagittal plane. The root of the nose corresponds to the nasofrontal suture, which is not necessarily the lowest point on its dorsum, and which can usually be located with the finger.

Prn. *pronasion*—The most prominent point on the tip of the nose when the head is placed in the eye-ear (horizontal) plane.

Sn. *Subnasion*—The point of the angle between the septum and the surface of the upper lip. We seek it at the point where a tangent applied to the septum meets the upper lip.

Ls. *labrale superius*—Point of the upper lip lying in the median sagittal plane and a line drawn across the boundary of the mucous surface tangent of the curves.

Sto. *stomion*—The median point of the oral slit, when the mouth is closed.

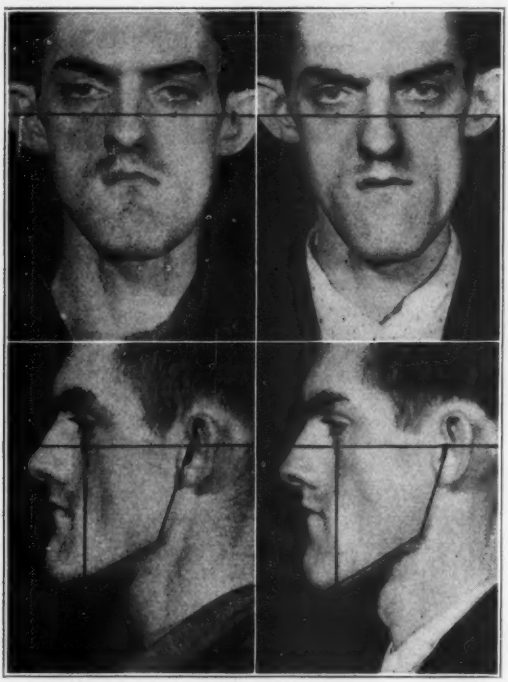

Fig. 8.—Photognathostatic reproductions of mandibular protraction.

Li. *labrale inferius*—A point where the boundary of the mucous membrane of the lower lip is intersected by the median plane.

Gn. *gnathion*—The lowest point in the lower border of the lower jaw which lies in the median plane. It is a point on the bony border palpated from below and naturally lies posterior to the tegumental border of the chin.

Or. *orbitale*—The lowest point in the margin of the orbit (directly below the pupil when the eye is open and the patient looks straight ahead), which may readily be felt under the skin. The eye-ear plane passes through the orbitale and tragion.

T. *tragion*—The notch just above the tragus of the ear. It lies 1 to 2 mm. below the *spina helicis*, which may be palpated.

Go. *gonion*—The lowest, posterior and most outward everted point of the mandibular angle. (In locating the point, the patient is cautioned not to turn his head, but to look straight ahead.)

Ch. *cheilion*—The lateral terminus of the oral slit; the so-called corner of the mouth.

In order to localize any deformity, or asymmetrical deviation of the face or denture, it is necessary to consider its relative position in three planes. For this orientation, it is helpful to use Simon's recommendations for denture topography. Figure 3 shows thirty areas which Simon describes as follows:

A. A median sagittal section divides the denture into a right and left half.

B. Five horizontal sections divide it into six parts: 1. the upper jaw, 2. the lower jaw; with one division in the region of the occlusal plane. Each of these halves is subdivided in the regions of the necks of the teeth and of the root apices; this yields the following:

for the upper jaw:	for the lower jaw:
(a) dental,	(a) dental,
(b) alveolar,	(b) alveolar,
(c) maxillary;	(c) mandibular.

C. A frontal section which passes through the canines and first premolars, yields: (a) an anterior and (b) a posterior region. (It is practical to regard the region of the incisors as an "incisal section.") A further differentiation of the mandible is as follows:

(a) right horizontal part,
(b) left horizontal part,
(c) right ascending ramus,
(d) left ascending ramus,
(e) right mandibular angle,
(f) left mandibular angle.

Earlier in this discussion, I described a number of measure points which are of value in diagnosis. By locating these points on photognathostatic reproductions of patients, it is possible to recognize and determine the extent of facial symptoms accompanying abnormalities of the jaws and face. These facial symptoms are, in most cases, characteristic of the deformity which they accompany.

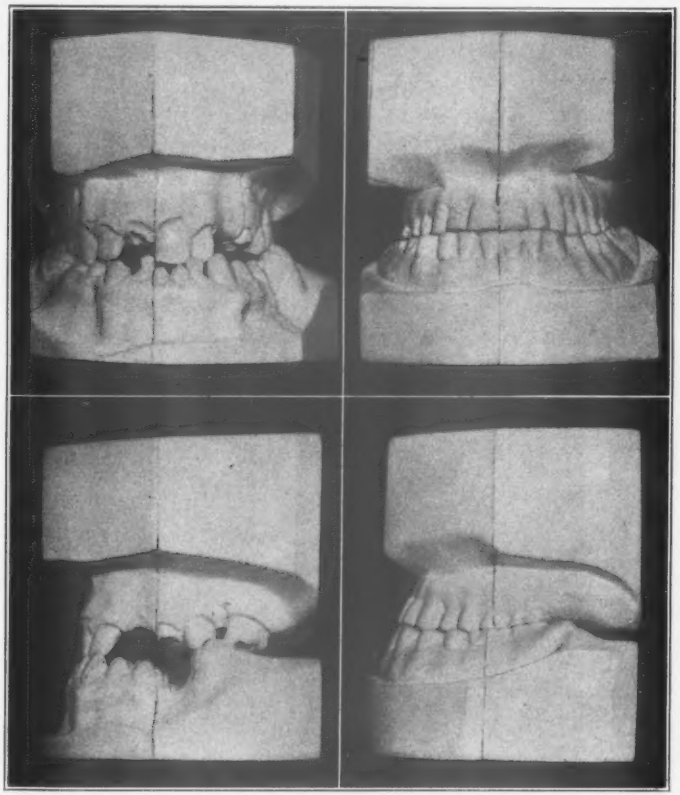

Fig. 9.—Plaster reproductions of dentures for patient in Figure 8.

Figure 4, above, is a photognathostatic reproduction of a case of total mandibular retraction. In addition, there is a maxillary alveolar protraction. The facial symptoms of this abnormality are quite obvious and may be described as follows: a. Short receding chin. b. Short body of the mandible (distance Gn.-Go.). c. Thick lower lip, lingual to maxillary anterior teeth. d. Short upper lip (distance Sn.-Ls.). e. Considerable opening between lips showing maxillary teeth (distance Ls.-Li.). f. Opening of the angle of the jaw (T.-Go.-Gn.).

Figure 4, center, shows another patient falling in the same classification and exhibiting the same facial symptoms.

Figure 4, below, is a photognathostatic reproduction of still another case of mandibular retraction. However, in this case, there is no abnormality of the maxilla. The difference in the upper lip is evident. Whereas the other patients had a short upper lip, forming an acute angle with the nose, this patient has a long upper lip nearly at right angles to the nose. Likewise, there is no space between the lips, and the teeth do not show. From the standpoint of esthetics, this case is much more simple to reconstruct than that shown in Figure 4, above or center.

Figure 5, above, is a photognathostatic reproduction of a case of mandibular protraction. The facial symptoms in this case are: a. Long protruding chin. b. Lower lip anterior to upper lip. c. Long upper lip (distance Sn.-Ls.). d. Upper lip forming an obtuse angle with the nose (Prn.-Sn.-Ls.). e. Long body of the mandible (distance Gn.-Go.). This abnormality is the opposite to that shown in Figure 4, below.

Fig. 10.—Patient presenting mandibular retraction and maxillary alveolar protraction.

Figure 5, below, is a photognathostatic reproduction of a case showing no abnormality, and which has been completely edentulous for a long period. The facial symptoms shown here are characteristic of edentulous patients and may be listed as: a. Decrease in height of the lower third of the face, lower lip approaching the tip of the nose (distance Li.-Prn.). b. Prominence of the chin. c. Shortening of the upper lip (distance Sn.-Ls.). d. Angle formed by upper lip and nose almost eliminated (Prn.-Sn.-Ls.). e. Corners lower than the center of the mouth (Ch. lower than Sto.).

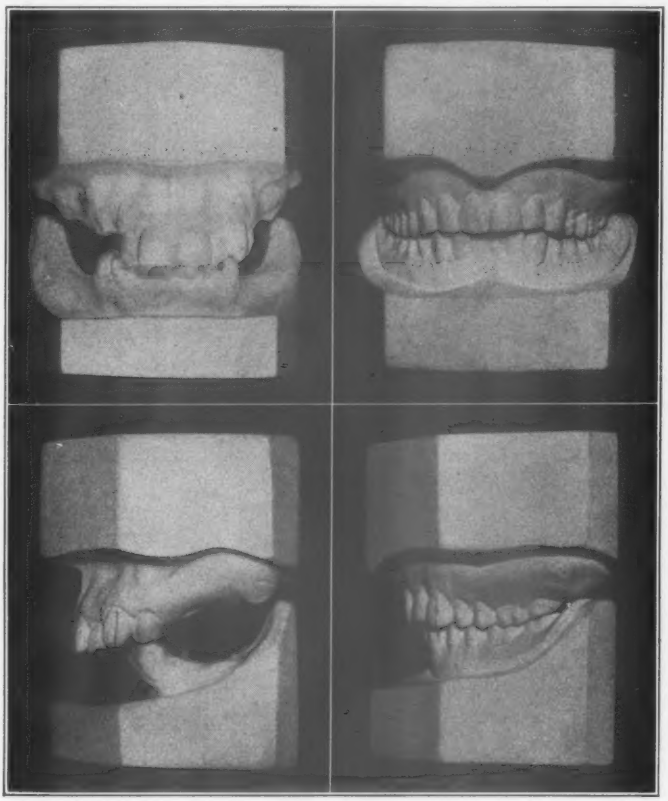

Fig. 11.—Plaster reproductions of dentures for patient in Figure 10.

It may be seen from the photognathostatic reproductions illustrating the facial symptoms that the loss of teeth has not corrected the deviation in form of the face and jaws acquired before this loss of teeth. Since these abnormalities exist after the loss of teeth, it is necessary for us to recognize them in making a diagnosis, if we are to give the patient an accurate prognosis. The patient is entitled to know the extent to which we can correct his facial deformity from the standpoint of esthetics and function. In many cases, it is beyond the scope of our art to correct the deformity, although the facial symptoms are improved, the deformity appearing less pronounced. Is it

not reasonable, if we are to offer the patient an opinion regarding the correction of a deformity, that we first recognize the type and degree of the deformity?

I shall now present photognathostatic reproductions and pictures of plaster reproductions showing both eugnathic and dysgnathic dentures. In each case, the picture to the left is preoperative and the picture to the right postoperative.

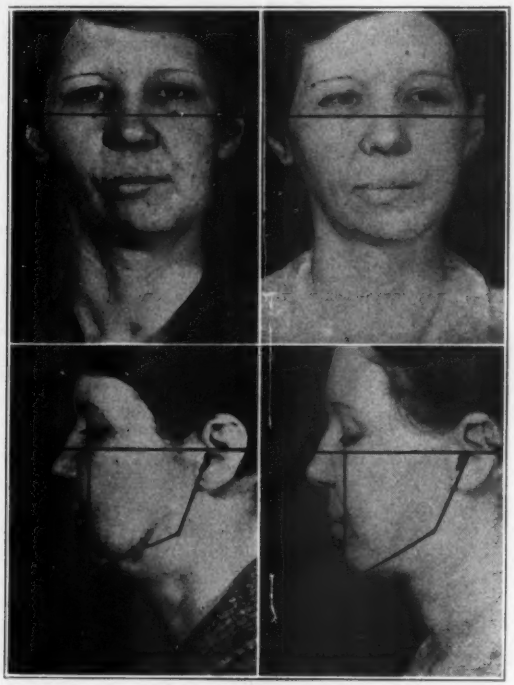

Fig. 12.—Photognathostatic reproductions of anomaly due to injury.

Figure 6 shows records of a eugnathic denture. The patient had been wearing dentures for several years. Owing to resorption, there was a decrease in the height of the lower third of the face. It was possible to restore this denture to a normal dentofacial relationship simply by increasing the interdental dimension.

Figure 7 shows plaster reproductions of dentures for the same patient. From the picture of the old dentures, we see that the teeth were set too far posteriorly in relation to the orbital plane, while, in the picture of the new dentures, the teeth are in correct relation to the orbital plane; that is, the orbital plane passes through the maxillary canine.

Figure 8 is an example of a dysgnathic denture. The patient had a mandibular protraction. As may be seen, little improvement was made in the facial symptoms. The abnormality was still present after denture construction.

Figure 9 is a picture of plaster reproductions of the same case. Here, we see that even though the teeth are not in correct relation to the orbital plane, after denture construction, the functional surfaces of the teeth have been improved.

Figure 10 is a photognathostatic reproduction of a case presenting mandib-

ular retraction and maxillary alveolar protraction. By performing an alveolectomy in the anterior region of the maxilla and properly arranging the teeth, we were able to improve the facial symptoms and make the anomaly appear less pronounced. Figure 11 shows the plaster reproductions for this case. Here, we have not reached, but have approached, the correct relationship of the teeth to the orbital plane. Function has been restored.

Figure 12 is a photognathostatic reproduction of an unusual case. The patient, so the case relates, had no anomaly of form until she met with an accident. Part of the jaw bone was removed after the accident. The result was a retraction of the mandible, the right side of the mandible being shifted until the mesial surface of the right cuspid was in the median plane. By extraction of the teeth and insertion of dentures, the patient's appearance was greatly improved. This is especially noticeable in the front view of the patient. Figure 13 shows plaster reproductions of the denture. It may readily be seen that the functional surfaces of the teeth have been improved. This patient has been wearing these dentures quite satisfactorily for three years.

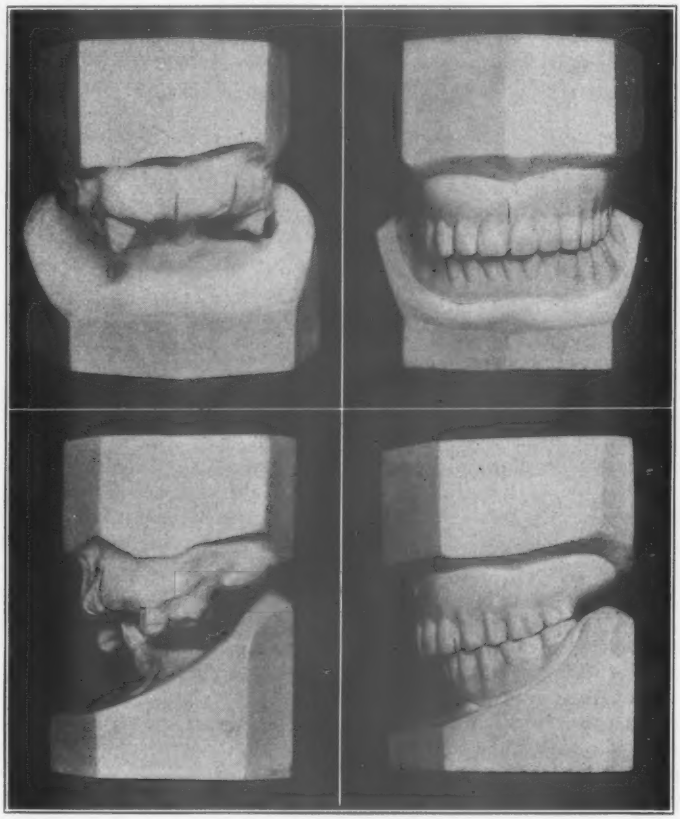

Fig. 13.—Plaster reproductions of dentures for patient in Figure 12.

Time will not permit me to classify all the abnormalities that we may encounter in prosthetic dentistry or to discuss the methods for their correction. It is hoped that, from this discussion, the necessity for recognition of abnormalities of the face and jaws in diagnosis of denture mutilations will be recognized. Prosthetic dentistry can never take its proper place as an important branch of the medical sciences until we consider the denture as a part of the human body, in both diagnosis and treatment.

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ANATOMIC AND PHYSIOLOGIC CONDITIONS GOVERNING THE USE OF THE TOOTHBRUSH

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IT is not uncommon to see people who have retained all their teeth to old age, but few of these people have well-formed gums in a good state of health. The lack of regular and thorough cleaning or the use of harmful devices and methods has usually resulted in much recession and infection of the investing tissues. The aim should be toward an ever-increasing number of those who retain not only the teeth, but also the anatomic form and the health of the investing tissues. This can best be accomplished by persistent educational efforts. We must, however, recognize the fact that there are too many dentists who still believe that the loss of the investing tissues of the teeth is a normal process and who advocate the use of devices and methods of cleaning that the tissues cannot continue to withstand.

Because we have become accustomed to the scientific terms applied to the teeth and gums, we lose sight of the fact that the teeth are bones protruding through soft tissues, where conditions are extremely unfavorable for maintaining health. The margins of these soft tissues receive much friction and pressure from food. During mastication, the food must pass upward over the upper teeth and gums and, at the same time, downward over the lower. Then, too, the protruding portions of the teeth become coated with débris and harbor an abundant bacterial flora.

It is, therefore, essential to study the form and functions of the investing soft tissues of the teeth which enable them to withstand the friction of food and turn it into a cleansing and stimulating action. In that way, we can learn how to give the tissues beneficial and lasting aid and avoid mistakes. These soft tissues develop thin, tough, free margins which act as buffers to protect their attachment to the teeth. These free margins are necessary for protection, but they create

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a sulcus around each tooth, which, if deep, retains débris and permits the rapid development of bacteria. The preservation of these thin, free gingival margins; the gentle but thorough cleansing of the sulci to prevent the development of crevices, and the consequent migration apically of the epithelium will be the main theme of this paper.

When normal, the gingival tissues are attached nearer the incisal edges on the proximal sides of the teeth than on the labial and lingual sides. This provides sloping, self-cleansing floors for the sulci. The form of the gums also plays an extremely important part. Since the free margins of the gingivae are given their greatest length on the proximal sides of the teeth, they form a series of inclined planes. The triangular septal gingivae not only fill the interproximal spaces of the teeth and prevent the entrance of food into these spaces from the labial and lingual sides, but also serve to slide the food over the deeper structures and permit just enough of it to pass through the sulci to cleanse them. It is readily seen that the sulci can be more easily entered and thoroughly cleaned when the cleansing friction follows the same general direction as the food. When the friction is directed toward the crowns of the teeth, the free margins of the gingivae cover, and make it difficult to reach, the portions of the teeth that are most in need of cleaning. As the gingivae are end-organs, they require friction from the direction of the crowns of the teeth to promote the circulation by pressing out the stagnant venous blood and allowing fresh arterial blood to enter.

The weakest part of the denture is at the bottom of the gingival sulci, where the sulcate epithelium is attached to the cementum; but, even there, the union is strong enough to withstand the stress and friction of ordinary food and cleaning that is not severe. This union can even be strengthened by judicious stimulation, but we should remember that all stimulants become irritants when they pass a certain point. The union will not withstand severe abuse. It is not like the epithelial attachment around the teeth of gnawing animals, where the growth of the teeth constantly renews the line of attachment. We may, within certain limitations, press back the cuticle around our nails, but we must not press back the epithelial attachment around our teeth.

Like other important parts of the body, the gingivae must have their normal anatomic form in order to perform their functions. When their free margins are swollen or their septal points are shortened or removed, they form an obstruction to the passage of food and are bruised and injured by it. The need for a normal form of the gingivae does not lessen as we advance in years.

The prophylactic care of the teeth and their investing tissues should be shared by the patient and a highly trained dentist, one who will carefully clean and polish the teeth and successfully treat any disease condition that may be found in the investing tissues. The patient's part is to maintain the high polish and stimulate and strengthen the investing tissues every day during his entire life. His care must never become intermittent.

To be of any real aid to the patient, the dentist must do much more than carefully clean and polish the teeth. He must educate the patient to value the gingival tissues and make sure that he knows how to give them the right kind of care. There is no time when educational aid is of greater value than in early life. At first, while the deciduous teeth are being cared for, the instruction can be given chiefly to the mother or to whoever has charge of the child. By the time the permanent teeth begin to erupt, the normal child will understand and take an interest in the things that are told him, if the ideas are presented in an impressive way. He should be told that it is important to clean the

portions of the teeth that can be seen, but much more important to clean the portions of the crowns that are out of sight, the portions that are covered by the free margins of the gingivae and the proximal sides, including the contact points. Then, to make sure that he will not treat the gingival tissues too harshly, the dentist should let him see how carefully he passes the thin edge of the small soft rubber polishing cup beneath the free margins of the gingivae to complete the polishing of the teeth. When the lesson is emphasized as it should be, the child will never again allow the careless dentist to bruise and injure the gingival tissues in any kind of dental work.

The life-long preservation of the teeth and their investing tissues brings the problem of attrition and abrasion to the attention in a new and forceful way, since both types of tooth destruction increase in severity year by year. While both of these terms indicate a loss of tooth structure by friction, their cause and effect are very different. Attrition is the result of a physiologic process, the wearing away of one tooth surface by friction from another tooth. It occurs on the occlusal surfaces and at the contact points and is brought about chiefly by the movement of the teeth during the mastication of food. Abrasion, on the contrary, is man-made and is much more subject to control. One of the chief causes is friction applied to the teeth in endeavoring to keep them clean. Both types of destruction progress much more rapidly in the softer structures of cementum and dentin.

When the teeth are held firmly in their sockets by normal investing tissues, the loss of the contact points by attrition is greatly lessened. The preservation of the contact points is extremely important because they protect the septal gingivae. Unfortunately, firmness of the teeth does not prevent the loss of tooth structure by attrition on the occlusal surfaces. On the contrary, it has the tendency to increase the destruction. The loss of tooth structure by attrition on the occlusal surfaces, which progresses slowly at first, becomes a serious problem as we advance in years. It results in unbalanced occlusal planes, which exert a harmful pressure on the investing tissues.

There is nothing more helpful in the daily care of the teeth and their investing tissues than a toothbrush, properly used. At the same time, nothing has been so destructive of tooth structure by abrasion or has caused so much recession of the investing tissues as the use of stiff, ill-shaped brushes. A study of the various methods that are employed in cleaning the teeth, as well as the types of brushes that are advocated for this purpose, is illuminating.

The first of these methods is the primitive, or child's, way of cleaning the teeth by brushing horizontally. This method bridges and does not clean the proximal sides of the teeth. When persisted in, it cuts deep grooves in the teeth at the gingival line.

The rotary, or circular, movement of the brush has also been advocated. This is a slight improvement over the child's method, as some of the strokes of the bristles travel in the same general direction as the food; but for every good stroke, there is a horizontal one which cuts grooves in the teeth as rapidly as the primitive method. All types of friction gradually wear away some of the tooth structure, but these two methods of cleaning are among the most destructive.

The method of brushing from the gums toward the incisal edges of the teeth, directly opposite to the way the food travels, is the one that has been given the greatest amount of publicity. It has been taught in the schools and advertised extensively in popular magazines. This method does no special harm, but it does not do a sufficient amount of good, since the free margins of the gingivae, which cover some of the cervical portions of the teeth, carry the bristles past, and

prevent them from cleaning, the very portions that need it most. It is contrary to nature and does not properly aid the circulation. The one thing that can be said in its favor is the fact that the patient usually gives some of the good strokes with the brush while faithfully trying to follow the prescribed method.

The vibratory method, which is an effort to force the bristles of the brush into or through the interproximal spaces, has a limited use in the prophylactic care of the teeth. It may be found helpful in cleaning denuded portions of the roots when much of the investing tissue has been destroyed by infection or radical operation. It may be less abrasive on the softer structures of the roots than other methods; but it should not be used when the investing tissues are normal. Since one of the chief functions of the septal gingivae is to prevent the entrance of food into the interproximal spaces from the labial and lingual sides, it must be obvious that we should not ignore the importance of this function by forcing the stiff bristles of a brush into these interproximal spaces. The septal gingivae cannot withstand such abuse.

The physiologic method is the one which gently cleanses the gingival sulci and massages the investing tissues by permitting the bristles of the brush to travel in the same general direction as the food. The main strokes of the bristles are guided upward over the upper teeth and gums and downward over the lower. This is Nature's way of cleansing and stimulating the tissues. If some of the strokes should travel in the opposite direction, that is toward the incisal edges of the teeth, they will be harmless; but a few horizontal strokes of the brush in the molar region will aid in cleansing the portion of the sulci that is directly over the bifurcation of the roots. The horizontal strokes should be given separately and be limited to a few, since they wear grooves in the cervical portions of the teeth. It is very important to do the cleansing and stimulating work in a uniform way. There is a tendency to neglect surfaces of the teeth that are hidden or difficult to reach, and it will be found helpful, in overcoming the habit of neglect, to count the number of strokes of the brush required to thoroughly clean surfaces of the teeth that are easy to reach, and then apply the same number to the less accessible parts.

The brush, which will be described later, must not injure or irritate the tissues. It is irrational to brush unhealed or diseased gums, but, when healed, they can be strengthened by the judicious application of friction, just as the hands can be toughened and strengthened by labor. It is the amount of friction, and not its harshness, which strengthens the tissues. The process is gradual.

Although normal, well-formed contact points of the teeth are essential for the preservation of the septal gingivae, they are constantly subject to loss of form by both attrition and decalcification. Attrition of these points, as has been stated, may be considerably lessened by the preservation of strong, well-formed investing tissues. Decalcification, on the contrary, is usually the result of neglect, the insufficient cleaning of these surfaces. Important as cleaning is, there is no type of brush and no method of using it that can force the bristles between these points and thoroughly clean them when the teeth are in their normal position. They must be cleaned some other way, and there is nothing more efficient for this purpose than flat dental floss, when used carefully. It can clean not only the contact points, but also small areas on the proximal sides of the teeth that the brush has failed to reach.

To control the floss and keep it from injuring the gingival tissues, the fingers are held close to the teeth and the floss is inserted in each space with a short sawing movement until the tight-fitting contact points are passed. Then, starting at the bottom of the sulci, the operator

carefully and thoroughly cleans the remaining portions of the proximal surfaces. Careless passing of the floss into these spaces may remove coarse particles of food, but it does not clean and polish the teeth.

The dentist is frequently asked how often the teeth should be cleaned. This can be answered in a practical way by asking how frequently the dishes should be washed. While this is good advice, it is not always possible to carry it out; but no matter how frequently the teeth may be cleaned during the day, they should always be cleaned thoroughly before bedtime, since bacteria increase rapidly in the mouth during sleep. Then, too, one can always take sufficient time at night to do the work thoroughly. A good guide to thoroughness is a memory of the delightful smoothness of the teeth when the dentist has finished polishing them, and the patient should resolve to continue the cleaning until each tooth has reached the same degree of smoothness.

If it were merely a matter of cleaning the teeth and no attention to the tissues that support them were necessary, a stiff brush would clean more rapidly than one that has fine, flexible bristles; but the investing tissues will not withstand the use of stiff brushes year after year throughout life. In special cases in which the roots are badly denuded and the septal gingivae are completely destroyed, it may be found helpful to use a brush with separated tufts of firm bristles that can be forced between the roots; but the only brush that should be used in most cases is one of medium size that has small tufts of fine bristles arranged in four parallel rows and trimmed to an even length. This is simply the old-fashioned plain brush; one that has been almost driven off the market because no one can claim it as his brush and make a special profit from the sale.

The bristles of a brush, being flexible, automatically fit all widths and forms of teeth and do not have to be cut into notches or placed in widely separated tufts. It is evident that any arrangement of the bristles that would fit the lower incisors would not fit the upper incisors or the molars, and if they could be made to fit when the brush is used in a horizontal position on the labial and buccal surfaces, they would not fit when the brush is used in the reverse position on the lingual surface. All such irregularities in the length of the bristles cut down the efficiency of the brush, but it is the stiffness of bristles that makes them irritating and destructive to the tissues. The harmful effect of the brush is always increased by using coarse bristles instead of a fine, high quality. Grouping the bristles in large tufts, and trimming them short also increases their rigidity.

It requires more time to clean the teeth with a brush that has fine, flexible bristles, but that is a distinct advantage, as the extra amount of work stimulates and strengthens the gingivae and makes them much more resistant.

Patients who have used the physiologic method in cleaning their teeth for more than forty years have had no difficulty in retaining the anatomic form and health of the investing tissues.

In the selection of a toothbrush, commercialism has become responsible for the development of a deplorable and perplexing problem for the general public. One company trims the bristles of their brush in a certain way. Another firm trims their brush in the opposite way. Reducing the number of tufts of bristles and placing the tufts in special positions have made it possible to put many new types of brushes on the market. Even special shapes and colors of handles have been added as distinguishing features. The manufacturers resort to the use of any device that will sell their brushes.

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DRUGS IN PERIODONTAL THERAPY

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THERAPEUTIC practices often profit greatly from an occasional pause to review their history and to study their present status. In a measure, such is the purpose of this essay; that is, to evaluate the use of drugs in periodontal therapy.

It is, of course, not true in a practical sense that "there is nothing new under the sun" and that "history repeats itself." However, the frequency with which obsolete remedies are resurrected and given a new birth as the latest discovery in therapy is striking. Familiarity with the history of periodontal therapy should enable one to recognize these discoveries as resurrections. One example will illustrate this point: Earlier in the history of periodontal therapy, sulfuric acid was used in the treatment of the so-called pyorrhea pocket. The reasons for discarding its use are probably familiar and obvious to all. Nevertheless, it was reintroduced into the realm of periodontal therapy in more recent years in a concentration of approximately 40 per cent as a proprietary preparation, at a cost to the purchaser of $10 per 20 cc. and with a tuition charge of $100 for instruction in its use. The formula of the nostrum was not revealed by its promoter.

In the not-too-distant past, much time was required and, in many instances, useless suffering on the part of patients resulted before such notorious remedies were exposed in their true light. The medical profession recognized years ago that provision should be made to inform its members regarding such matters. Accordingly, more than thirty years ago, the American Medical Association created its Council on Pharmacy and Chemistry and, more recently, its Council on Foods and Council on Physical Therapy. Profiting by the example of the American Medical Association, the American Dental Association created its Bureau of Chemistry and Council on Dental Therapeutics, in 1930. Through the activities of the Council on Dental Therapeutics, the dental profession is currently informed regarding medicinal agents advocated for dental use. The mysticism of worthless, empiric therapy can now be cast aside for a rational therapy of genuine usefulness. The discussion to follow is based, in part, on the findings of the Council on Dental Therapeutics. For the convenience of discussion, periodontal remedies will be considered by arbitrary groups or classes. Few, if any, drugs will be considered individually, but rather the broad principles underlying their use as groups will be discussed.

I. MOUTHWASHES

Extravagant therapeutic claims for certain mouthwashes still ring out in many quarters. The radio announcer has replaced the carnival and patent medicine barker, but the theme is the same old one of the mystic healing powers of a highly colored and flavored solution, misleadingly labeled to catch the unwary eye. It is a sad commentary that a

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large element of the dental profession is still spellbound by this mouthwash mysticism. The Council on Dental Therapeutics has reviewed the mouthwash problem in all its aspects and its conclusions are worthy of careful study. Briefly stated, these conclusions are that mouthwashes, as commonly used, can do no more than aid in the removal of loose food and débris, and this by virtue of the mechanics of rinsing.[1] On this score, it is obvious that water would serve as satisfactorily as any of the proprietary mouthwashes. Regarding the germicidal value of the mouthwash, the Council holds that there is no evidence that mouthwashes do more than temporarily reduce the gross numbers of bacteria in the mouth.[1] This action also may be due in large part to the mechanical cleansing of rinsing.

The claims that certain mouthwashes are "germicidal" or "antiseptic" are grossly misleading as far as their therapeutic value is concerned. Unfortunately, such labeling is permitted because it complies with arbitrary tests formulated by the Food and Drug Administration of the U. S. Department of Agriculture. However, under practical conditions of use, germicidal and antiseptic values established by laboratory tests must be viewed with extreme skepticism and as of unconfirmed therapeutic significance.

The story of the mouthwash is not complete without comment on the dangers of indiscriminate use of medicated and irritating preparations. Solutions containing zinc chloride, phenol, formaldehyde and mercurial compounds, for example, are potentially harmful to the oral mucosa when used indiscriminately over a long period of time, as is done by a large segment of the laity. Such observations are also commonly made on the use of sodium perborate in solution as a mouthwash.[5] The irony of the use of sodium perborate solutions is that, contrary to popular belief, these solutions, under clinical conditions, liberate only a scant fraction of their chemically available oxygen, approximately 0.25 per cent. This quantity is so minute that no one can rightfully hazard a therapeutic claim for it. On the other hand, the potential dangers incident to its use are great.

Viewing the facts from all angles, one may conclude that a warm, slightly hypertonic solution of sodium chloride has all the good features of any mouthwash and is devoid of all its potential dangers. In addition, through the osmotic action of the sodium chloride solution, the elimination of the edematous tissue fluids of inflammation may be hastened and normal circulatory function thus be promoted. This is of great value in periodontal therapy. Solutions having astringent properties act to the contrary.

It is worthy of note that of the hundreds of preparations marketed in the past and present as useful in the treatment of one or all of the periodontal diseases, Vincent's infection included, none has stood the simplest and most valuable test of all—the test of time.

Even with this historical background, a large number in the profession continue to tolerate, encourage and even promote newer and bigger frauds in the realm of mouthwashes with claims of usefulness in the therapy of periodontal disease. It is strange that so much of a commendatory nature can be said of so simple and inexpensive a remedy as a hypertonic solution of sodium chloride and that so much of a condemnatory nature must be said of the complex, the secret, the chemically high-sounding, the highly colored and flavored, and expensive solutions. The latter are widely promoted with the aid of advertising designed to frighten or coax the gullible into their use. It is unfortunate that many dentists are also gullible and uncritical in this regard. It is most disparaging to the high professional status claimed by dentistry that many dental societies solicit and condone such advertising and exhibits and console

themselves with the thought that they need the money so derived for their very existence. It would appear that many a professional soul is sold for a mess of unscrupulously compounded pottage.

II. DENTIFRICES

Much of what has been said of mouthwashes is directly applicable to the mixtures used in conjunction with the toothbrush. It would probably be superfluous to review these facts in reference to toothpastes, toothpowders and liquid dentifrices. However, a few concrete facts should be borne in mind; namely, that a dentifrice can act only as an adjunct to the toothbrush in the promotion of oral cleanliness; that a dentifrice cannot alter, for any appreciable length of time, the chemical properties of saliva; that a dentifrice cannot significantly alter the character of the bacterial flora of the mouth; that there is no virtue in the stated superiority of a powder or a liquid over a paste, or vice versa; that a dentifrice can be mechanically and chemically injurious to the dental tissues; that no dentifrice has been proved to influence favorably the progress of any of the dental or periodontal diseases, and that a dentifrice cannot "detoxify" the mouth, "tone up the collapsed or congested capillaries" or fulfil any other items of wishful thinking on the part of the vendors of dentifrices.[2]

It may be stated that the dentist has a professional obligation to his patients in regard to their dentifrice problem. They should be routinely enlightened on this score in the interests of good dental care. Only by this means will consumer resistance be built up against unscrupulous dentifrice vendors and public support be aroused in behalf of the dentifrice manufacturers whose policies conform with those formulated by the Council on Dental Therapeutics for the protection of the public and the profession.

Attention should be critically focused on certain "approval services" now in operation, particularly one operating in conjunction with a magazine of nation-wide circulation. Apparently, its rules governing "approval" differ widely from those of the Council on Dental Therapeutics, since certain dentifrices unacceptable to the Council flaunt its "seal of approval," despite their unwarranted and extravagant therapeutic claims. The comedy in an otherwise serious problem is that a number of such "approved" dentifrices have been made the subjects of action by the Federal Trade Commission.

The extravagant and unwarranted claims typical of most of the dentifrice vendors are not matters of recent invention. In an issue of the *Virginia Gazette,* dated January 16, 1761, and published in Williamsburg, Va., there appears an advertisement by one James Carter for *"Greenbough's Tincture* for the *Teeth* and *Gums*—also very fine brushes for the teeth. Just imported in the Russian Merchant, Capt. Gaitskill, and to be sold reasonably by the subscriber." In the *Virginia Gazette* of November 6, 1778, the following appeared:

Doctor Baker's Dentifrice

Doctor Baker's well known dentifrice for curing scurvy, and preserving the teeth and gums, may be had at Mess. Dixon and Hunter's printing office, and at no other place in Virginia.

The same publication under date of December 11, 1779, carried the following advertisement:

Anne Neill's Dentifrice

Dentifrice for the teeth and gums, equal to Dr. Baker's, made by Anne Neill. The public may always be supplied by her, and at Mr. Brend's, Williamsburg. N. B. Mrs. Neill will allow two dollars for all the empty dentifrice pots that are returned.

In the *Epitome of the Times,* 1779, published in Norfolk, Va., the French Medicine Store advertised

Dr. Perron's Opiate for the Teeth and Gums. The best dentifrice for whitening teeth and taking off the tartar. . . .

I am indebted to Dr. W. N. Hodgkin, Warrenton, Va., for these historical references; and while these particular references may be viewed with historical interest as provincially early Virginian, it is probably true that the other original American colonies can boast of similar examples of the colonial and primitive forerunner of our present-day "glorified" dentifrice advertisements.

III. PYORRHEA ASTRINGENTS

Second only to mouthwashes and dentifrices in their extravagant therapeutic claims are the so-called pyorrhea astringents. Nearly all were, and many still are, marketed with secret or semisecret formulae.

The rationale of the use of an astringent in the treatment of periodontal disease is difficult to fathom. If adaptation of the gingivae to the cemental surfaces is the intent of its use, it must be admitted that its value is limited to a very few minutes of the several days required for complete healing of a treated periodontal lesion. The vasoconstricting action of astringents must be viewed as a detriment rather than an aid. Healing processes are directly dependent on an adequate blood supply to the part. Any process tending to diminish the blood supply delays healing for the duration of its action. Fortunately, the duration of the astringent action of such a drug when applied to the periodontal tissues is relatively short. Even so, a detrimental effect may be noted in many instances. Most astringent drugs precipitate albumin and form an irritating coat of proteinates over the surface of the mucous membrane to which they may be applied. The same action is said to occur within the tissues and in the walls of the arterioles. Transudation, the action of leukocytes and other healing phases of the inflammatory reaction are thus inhibited.[7]

It is to be noted that many drugs are irritants, astringents or caustics, their action depending on the concentration in which they are used. The potential harm of their usage is, therefore, apparent. Certainly, their irritating action is undesirable and overmedication is often followed by necrosis and sloughing. Statements that astringents as used in periodontal therapy promote healing are a bit of wishful thinking. Reports of such observations with accurate controls are not available. An appraisal of the usefulness of astringents as a class may be gleaned from a trade pamphlet in which the following statements appear:

In no case should the remedy be used before the teeth have been thoroughly scaled and polished. . . . If the surgical and prophylactic treatment preceding the medicinal has been done thoroughly, the case generally yields nicely. . . .

When several therapeutic measures are applied simultaneously in the treatment of a given disease, one may question the relative or real merits of each, until their individual merit is scientifically established. This has not been done in the case of the astringents. On the contrary, many skilful clinicians and careful observers demonstrate that satisfactory results can be obtained without the potential damage and delayed healing incident to their use.

IV. ANTISEPTICS AND GERMICIDES

The prevalence of a bacterial phase in the etiology of most periodontal diseases, even though it be of secondary importance in their causation, has led to the widespread practice of the medicinal type of chair-side therapy for these involvements. This is true of not only acute Vincent's infection of the periodontal structures, but also of the nonspecific types of chronic periodontitis. This practice may appear to be justified in the instance of acute Vincent's infection. However, even in this field, important newer findings raise grave doubts

regarding the value of medicinal therapy in this disease.

The drugs advocated for use in the treatment of Vincent's infection of the mouth are too numerous to mention and too varied to be classified accurately. All have had their advocates, who held that their particularly proposed drug was a panacea. The wide variety of these drugs and the conflicting therapeutic claims for each of them are indicative of the confusion prevailing in regard to the therapy of this disease. The numerous claims and counterclaims may be interpreted to indicate their general inefficacy in the treatment of the disease for which they were advocated. With such a divergence of unproved opinions prevailing, it is little wonder that notorious and worthless secret proprietary compounds have flourished. Thoughtless and unscientifically minded clinicians have often given unstinted praise to such preparations of secret formulae and questionable value.

It is axiomatic that, barring fatal terminations, all acute infections, irrespective of treatment or lack of it, run their course to complete resolution or else resolve themselves into a chronic state.[6] This is typical of acute Vincent's infection and has frequently been so reported in the literature.[4]

The observation that an acute inflammatory reaction subsides following the use of a given drug is no proof that the drug has any therapeutic merit. Newer clinical observations, based on accurate controls, indicate that the topical application of a germicide does not favorably influence the course of these involvements to any material degree.[6] The same observations are recorded in regard to intravenous therapy of this disease.[8]

Interestingly enough, the concept of the etiology of Vincent's infection has been markedly revised by recent findings,[9] all of which tend to explain the unsatisfactory therapeutic experiences of the past in the use of medicinal agents. Critical clinicians now recognize that the local care of the tissues in this disease is best exercised by immediate manipulative procedures designed to open, cleanse, aerate and irrigate the focal zones of the disease. This can be done without surgical trauma. The hemorrhage necessarily induced, even by digital pressure, tends to wash out the focal zones and results in a more adequate defensive circulatory response.

It is, of course, recognized that certain other treatment must be given in these cases; namely, general supportive care, attention to related systemic disturbances and local hygienic measures. A full discussion of this problem by Theodor Rosebury and the writer is given in Gordon's "Dental Science and Dental Art."

The use of medicinal agents in the treatment of the chronic suppurative and pocket-forming types of periodontoclasia is still widely practiced; in many instances alone, but more often as an adjunct. Here, again, the bacterial phase, of secondary importance in the causation of these diseases, has given impetus to such practice. The universal failure of such practice is explained by an accurate appraisal of the etiology of and the tissue changes in the disease. It must be borne in mind that the disease is fundamentally degenerative, by virtue of possible systemic factors, the local influences of malfunction and the prevalence of direct traumatic and chemical irritants in the afflicted mouths. The bacteria invade the tissues only after the degenerative changes have occurred. They play a secondary part in the disease picture. Primary emphasis on them in therapy is, therefore, misplaced.

Granted that the bacteria of a periodontal lesion may be annihilated by the use of a germicide without marked injury to the tissue host, it can be a matter only of seconds before the field is reinvaded by other bacteria from the mouth. Such an approach to the treatment of this disease is obviously a useless one.

It is quite apparent that therapy must correct the conditions which permit bacterial invasion and activity in these tissues. This cannot be done by vaccines, sprays, gas insufflation, ointments or lotions.

V. POCKET DRESSINGS

Numerous proprietary compounds have been marketed as so-called pocket dressings. They are compounded as liquids, powders, pastes and cements. In the majority of instances, they are advocated for application to the periodontal lesion after instrumentation, with varied and sundry claims, all unproved. With the possible exception of the cavernous cystic lesions, surgically treated lesions are preferably left with the parts closely approximated and only a blood clot intervening. This is a surgical principle which is now accepted as an axiom. It is also axiomatic that a good blot clot is the best dressing that any wound can have. The blood clot is most essential since it serves temporarily to close the wound, affords the natural antibacterial defenses of the body and promotes the immediate formation of the healing granulation tissue.

A foreign compound introduced into an instrumented periodontal lesion necessarily takes the place of a large portion of the normal blood clot. Healing can then not occur by first intention and is ultimately delayed until the pocket dressing is dissolved, absorbed or expelled from the wound. By the time this occurs, the epithelium of the gingivae has had an opportunity to grow down the gingival side of the pocket; after this, true reattachment of the gingivae to the cemental surface is no longer possible. A so-called compromise healing of the lesion is all that can be expected. No real advantage in the use of pocket dressings has been scientifically established.

VI. EPITHELIAL SOLVENTS

Epithelial solvents have been advocated by McCall[10] and others for the purpose of chemically removing the epithelium from the inner gingival wall of a periodontal lesion. This is proposed to promote actual reattachment of the detached gingivae to the cemental surfaces. Again, experience has failed to show that epithelial solvents are necessary to successful periodontal therapy.[3] The postoperative inflammatory reaction following skilful instrumentation apparently suffices to induce destruction of the proliferated epithelium, as is evidenced by the actual obliteration of selected periodontal lesions following conservative instrumentation. The injurious effects of epithelial solvents on the alveolar or oral mucosae warrant extreme caution in their use.

VII. CAUSTICS

Fortunately, the use of drugs for the cauterization of periodontal lesions is not popular. However, it is by no means discarded. It is proposed by the advocates of such agents that the granulation tissue of a periodontal lesion be removed by this or other means on the theory that it must be done before healing can occur. This suggestion does not conform with the basic facts of pathology and physiology. The development of granulation tissue in lesions characterized by chronic inflammation is a manifestation of an "effort of repair," in the parlance of the pathologist. It is in itself an actual healing effort, unsuccessful for the time being because of the continued action of superior destructive forces. Once the latter are completely overcome, the "effort of repair" goes on, to complete its healing process. If the granulations are destroyed in the course of treating a periodontal lesion, healing is actually delayed, since the formation of granulation tissue in the treated wound is an essential physiologic step in healing. Furthermore, the cauterized tissue, if not removed, is highly toxic and its presence further delays successful healing.

VIII. PREOPERATIVE AND POSTOPERATIVE MEDICATION

The problem of anesthesia and anesthetic agents will not be discussed here, since this is a broad subject in itself. Whether the use of an anesthetic agent is deemed a necessary preoperative step depends largely on the type of periodontal therapy employed, the patient and the skill of the operator. It should be noted, however, that the safety and general welfare of the patient demand that care be exercised in the selection of these drugs. Only regarding those preparations that have been proved acceptable to the American Dental Association Council on Dental Therapeutics and the American Medical Association Council on Pharmacy and Chemistry is there reasonable assurance of pharmacologic standardization, relative safety, purity and sterility. The use of unacceptable anesthetic agents is a dangerous practice, disregarding the fundamental tenets of the American Dental Association Code of Ethics, which holds that the welfare of the patient is paramount to all other considerations.

Periodontal therapy, by proper preoperative and postoperative medication, can be freed of much of the fear and discomfort sometimes experienced. For instance, an excessive salivary flow may be controlled by the administration of atropine sulfate in one one-hundred-twentieth grain doses. The tension of highly nervous patients may be reduced preoperatively by the use of barbiturates. Postoperative pain may be relieved by the use of analgesic agents. These agents should be selected and administered with care. Only the drugs included in Accepted Dental Remedies should be employed. These are numerous enough to offer a wide variety of choice. Such drugs should be prescribed in limited quantities or else supplied in plain containers with specific directions for their use. The dispensing of proprietary compounds not found acceptable by the American Medical Association Council on Pharmacy and Chemistry or the American Dental Association Council on Dental Therapeutics, and which are supplied to dentists in liberal quantities as professional samples, is a most reprehensible practice. The dispensing dentist becomes a professional booster and advertiser for a compound of secret or semisecret formula, the pharmacologic action of which may not be for the best interests of the patient. The latter becomes the innocent victim of an abhorrent and an all-too-general practice now widely in vogue. The continuance of such practices should not be condoned.

The plea is here offered that periodontal therapy be practiced on a rational basis and that drugs be used in their properly indicated rôles, but not empirically and to the exclusion of the fundamentally sound manipulative procedures of proved value. Whenever drugs are indicated, they should be selected from among those of established value. The drugs listed in Accepted Dental Remedies meet all the rational demands of drugs, in the light of our present knowledge. As soon as a drug is proved of value in dental therapy and is presented to the profession with honest and fair therapeutic claims, it is included in Accepted Dental Remedies. Its inclusion in Accepted Dental Remedies is, therefore, reasonable assurance to the practitioner and to the patients served by him that the drug has merit where indicated and that it is properly standardized and honestly marketed. With such drugs available, the use of unaccepted proprietary or non-proprietary drugs indicates a disregard of high professional principles and is a practice distinctly out of line with the best interests of the public which dentistry serves. It is to be hoped that dentistry may soon have the distinction of practicing its healing arts rationally and in the full light of the truth as it is revealed.

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Professional Building.

A HISTOLOGIC STUDY AND COMPARISON OF THE PULPS OF EMBEDDED AND ERUPTED THIRD MOLAR TEETH

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ERUPTED teeth are constantly subjected to conditions from which embedded teeth are protected. It is conceivable that, under different conditions, there might develop in such teeth structural changes in their tissues which could be demonstrated microscopically. This raises the following question: Is it possible to distinguish erupted teeth from embedded teeth by histologic examination of their pulp tissues? The present study was undertaken in an effort to answer that question.

For a number of reasons, the third molar tooth was chosen for study. It is the tooth most often found embedded. When erupted, it is often extracted in a sound condition, free from caries and fillings. Since embedded teeth are not subject to dental caries, a comparative study of embedded and erupted teeth should include only those erupted teeth free from caries and fillings. The third molar can usually be removed with less mutilation of the pulp tissues than can any other embedded tooth owing to its distal position in the dental arch.

MATERIAL STUDIED

The pulps of 152 third molar teeth were studied. Seventy-nine teeth were embedded and seventy-three were erupted, free from caries and fillings. Tables 1 and 2 present miscellaneous data regarding the teeth used in this study.

The dental pulp received our attention in this study. It reacts to various stimuli by changes in structure which can be seen microscopically. All struc-

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tures of the pulp were examined with the exception of the nervous tissue and the lymphatic system.

The pulps of the embedded and erupted teeth were compared on the basis of microscopic data on the following: cellular density of the stroma, amount of fibrosis, inflammation, calcification, vascularity and capillary bed subjacent to the odontoblasts.

In the two groups of teeth, a series of micromeasurements were made of the following structures: the dentinoid (uncalcified dentin) layer, odontoblastic layer and zone of Weil (cell-poor subodontoblastic layer).

The ratio of approximately three fe-

Fig. 1.—Fibrosis; embedded third molar tooth (×170) in patient aged 24, showing cellular density, Grade 2; fibrosis, Grade 2; vascularity, Grade 2. There is considerable fibrosis in this pulp. However, the cellular density of the stroma has not been decreased to any great extent.

males to one male in the series is coincidental. Montelius, on the basis of dental roentgenographic examination of 5,000 patients, stated that there is no significant difference in the incidence of embedded teeth in males and in females.

One method of securing the dental pulp for study is to crack the tooth and remove the pulp. To section an entire tooth so as to study the hard and soft tissues in their normal relationships to one another, it is necessary to decalcify the tooth by subjecting it to the action of an acid. The enamel is lost in the process of decalcification. Both methods were used in this study. Ten per cent formalin was found to be entirely satisfactory as a fixing fluid. Seven different decalcifying solutions were tested, the most satisfactory of which proved to

TABLE 1.—MATERIAL USED IN THIS STUDY

Teeth	Number of Teeth	
	Embedded	Erupted
Upper left third molar	20	24
Upper right third molar	28	16
Lower left third molar	19	15
Lower right third molar	12	18
Total	79	73

TABLE 2.—DISTRIBUTION OF MATERIAL ACCORDING TO AGE GROUPS OF PATIENTS

Patients		Number of Teeth	
Age, Years	Number	Embedded	Erupted
15-20	12	14	9
21-25	34	34	30
26-30	18	13	16
31-35	10	7	11
36-45	7	6	3
46+	7	5	4
Total	88	79	73

be the following[1]: concentrated nitric acid, 4 cc.; concentrated formalin, 4 cc., and distilled water, 92 cc.

The pulps from forty-two embedded and thirty-four erupted teeth were removed and frozen for sectioning. Forty-seven decalcified teeth (nineteen embedded and twenty-eight erupted) and the pulps from eighteen embedded and

eleven erupted teeth were prepared for sectioning by the paraffin method.

Since interpretation of the several points considered in comparing the embedded and erupted teeth depends on the normal, deviations from which can be recognized, it is necessary to explain what is considered normal. After examination of the pulp tissues of a large number of third molar teeth, certain numerical grades (Table 3) were adopted for recording the microscopic appearance of the various subjects studied.

TABLE 3.—VALUES ADOPTED FOR SUBJECTS STUDIED

Subject	Grade	
	Normal	Range
Cellular density	2	1–3
Fibrosis	1	1–3
Inflammation	0	0–3
Calcification	0	0–3
Vascularity	2	1–3
Capillary bed subjacent to odontoblasts	2	1–3

TABLE 4.—CELLULAR DENSITY

Teeth		Grade		
Number	Condition	1	2	3
79	Embedded	12	59	118
73	Erupted	12	53	8

TABLE 5.—FIBROSIS

Teeth		Grade		
Number	Condition	1	2	3
79	Embedded	63	16	0
73	Erupted	60	13	0

RESULTS

In the dental pulp are found the cellular elements recognized and distinguished by Maximow and Bloom in other parts of the body. The most conspicuous cells in the dental pulp have large oval nuclei and irregular stellate cytoplasm. These cells, with the reticular fibers, which run separately in all directions through the pulp, constitute the bulk of the stroma. If there appeared to be fewer than the average number of cells present, the cellular density was graded as Grade 1. When the dental pulp contained an average number of nuclei per unit area, the pulp was recorded as having a cellular density of Grade 2. Grade 3 indicated the presence of more than the average number of cells in a pulp. Table 4 indicates that this feature of the dental pulp would not serve as

TABLE 6.—INFLAMMATION

Teeth		Grade			
Number	Condition	0	1	2	3
79	Embedded	78	1	0	0
73	Erupted	67	4	2	0

TABLE 7.—CALCIFICATION

Teeth		Grade				Per Cent
Number	Condition	0	1	2	3	
79	Embedded	54	20	4	1	31.6
73	Erupted	53	15	5	0	27.4

TABLE 8.—VASCULARITY

Teeth		Grade		
Number	Condition	1	2	3
79	Embedded	14	60	5
73	Erupted	9	63	1

an aid in distinguishing embedded teeth from erupted teeth.

The dental pulp normally contains connective tissue fibers. A normal amount of fibrous tissue was graded as 1; moderate fibrosis, Grade 2 (Fig. 1), and a very fibrous pulp, Grade 3. There was a normal number of connective tissue fibers in a majority of the pulps studied (Table 5). The number of pulps with fibrosis Grade 2 is nearly the same in both the embedded and the erupted teeth. We see from these results that the degree of fibrosis will not serve as a means of distinguishing embedded teeth from erupted teeth.

accessibility of the upper third molar tooth to drainage from the paranasal sinuses. In the present study, the microscopic evidence of inflammation was graded from 0 to 3 (Table 6). Evidence of inflammation, although rare, was approximately six times more common in the erupted teeth than in the embedded teeth. The evidence of inflammation in the one case of an embedded tooth, listed as having inflammation Grade 1, was not altogether convincing. There were two very small foci in the coronal portion of the dental pulp, each of which appeared to be made up of a few small lymphocytes. Attempts to photograph

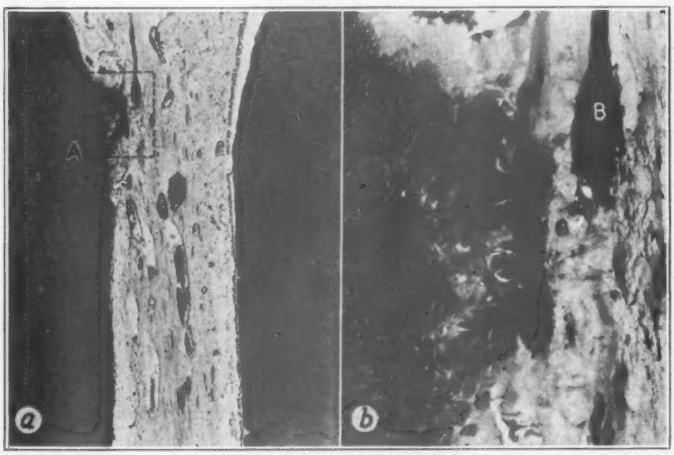

Fig. 2.—Interstitial and mural calcification. a, embedded third molar (×50) in patient, aged 46, showing cellular density, Grade 1; fibrosis, Grade 2; calcification, Grade 3; vascularity, Grade 1. b, area A under higher magnification (×250). There are several regions of interstitial calcification throughout this pulp. A narrow, irregular layer of odontoblasts can be noted. The irregular calcified region (A) on the wall of the dentin under magnification (b) appears to be made up of irregular globules of calcific material. The free surface is composed of an interstitial mass of calcified tissue similar to B.

Orban has said, "We generally speak of inflammation if we find a round-cell infiltration or a development of granulomatous tissue." Matteson has said that more infected pulps are found in embedded upper third molar teeth than in embedded lower third molar teeth because of the lesser density of the bone of the superior maxilla and the ready

these areas were disappointing. The inflammatory regions in the pulps of the erupted teeth consisted chiefly of collections of lymphocytes and plasma cells.

We must conclude from these results that inflammation is seldom seen in the pulps of intact third molar teeth, regardless of whether they are erupted or embedded. In attempting to decide, from

microscopic examination, whether a third molar tooth is erupted or embedded, evidence of inflammation is in favor of the tooth being erupted. However, lack of inflammation is not evidence of a tooth being embedded.

Calcification is a common finding in the dental pulp. The amount of calcified material present in the tissues of the pulps examined was graded from 0 to 3 (Table 7). These figures show that, contrary to popular belief, and for the material studied, calcification in the dental pulp is as common in embedded teeth as in erupted teeth. Therefore, calcification in the pulp is no aid in determining whether a tooth was embedded or erupted.

Kronfeld,[2] Cahn and Praeger have agreed that calcification of the pulp is preceded by fatty degeneration. Long-continued mild irritation and chronic infection (Newman) are given as etiologic factors in the production of calcification of the pulp. Recent investigators, including Stafne, Kronfeld[3] and Willman, state that calcification is present in at least from 80 to 90 per cent of pulps of adult teeth. In this study, the calcified masses were much more common in the radicular portion of the dental pulp. Interstitial calcification was the more common form. True denticles were rarely seen (Figs. 2 and 3). However, true denticles are probably more frequent than this study indicates. In a number of sections in which the pulp had not been decalcified, there were tears in the tissue, possibly due to the presence of true denticles which the microtome blade could not cut. With serial sections,

TABLE 9.—VASCULARITY AND FIBROSIS OF DENTAL PULP CORRELATED WITH AGE OF PATIENT

Teeth	Vascularity						Fibrosis					
	Embedded			Erupted			Embedded			Erupted		
Grade	1	2	3	1	2	3	1	2	3	1	2	3
Average age, years	34.3	25.9	24	36.7	29	27	24.6	34.2	—	25.5	34.6	—
Number of teeth	14	60	5	10	62	1	61	17	—	59	15	—

TABLE 10.—CAPILLARY NETWORK SUBJACENT TO ODONTOBLASTS

Tooth		Grade		
Number	Condition	1	2	3
79	Embedded	27	47	5
73	Erupted	27	46	0

TABLE 11.—AVERAGE AGE OF PATIENT CALCULATED FOR GRADE OF CAPILLARY BED

Tooth		Average Age, Years		
Number	Condition	Grade 1	Grade 2	Grade 3
79	Embedded	30.5	25.3	24.2
73	Erupted	28.8	26.4	....

TABLE 12.—MICRO-MEASUREMENTS OF DENTINOID LAYER, ODONTOBLAST LAYER AND ZONE OF WEIL

Tooth	Tissue Layer	Average Width, Microns
Embedded	Dentinoid	19.9
	Odontoblast	29.7
	Zone of Weil	31.0
Erupted	Dentinoid	17.6
	Odontoblast	24.3
	Zone of Weil	26.6

the number of pulps showing calcified regions would undoubtedly be considerably greater than the present study indicates.

In the normal dental pulp, there are an abundance of blood vessels, and the walls of these are comparatively delicate, like those of all vessels that are well protected from external injury or compression. Hopewell-Smith and Newton G. Thomas have expressed the opinion that they can identify arterioles, venules and capillaries in the pulp, whereas Cahn has stated that the whole circulation of the pulp is capillary.

Grade 1 was used to indicate few vessels per unit area of pulp tissue; Grade 2, to indicate an average number

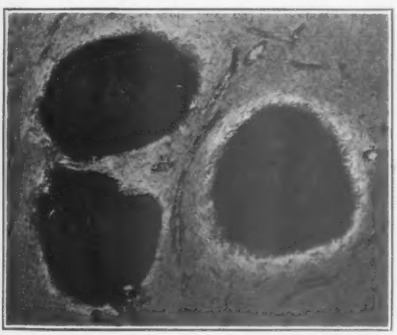

Fig. 3.—Three oval bodies in the pulp undergoing calcification; embedded third molar (×55) in patient aged 30, showing cellular density, Grade 2; fibrosis, Grade 1; calcification, Grade 2; vascularity, Grade 2. It is evident, even at this magnification, that the pulp fibers are an integral part of the calcifying masses. There is an abundance of blood vessels.

of vessels, and Grade 3, an unusually abundant vascular supply. In Grade 2 (Table 8), the number of embedded teeth and of erupted teeth is much the same. In Grade 3, 6.2 per cent of the embedded teeth have an unusually abundant vascular supply, whereas this is true of only 1.4 per cent of the erupted teeth. This indicates that a richer than average blood supply will be found more often in the pulps of embedded teeth than in those of erupted teeth. However, Grade 1 also was seen more commonly in the pulps of embedded teeth than in those of erupted teeth. The conclusion one is forced to draw from Table 8 is that embedded and erupted teeth cannot be distinguished from one another on the basis of their vascular supply.

With increasing age, there is a decrease in the vascular supply to the pulp and an increase in fibrosis. Table 9 shows that these statements are true for the third molar tooth, whether erupted or

Fig. 4.—Capillary hemorrhage (25 by 45 microns) in the odontoblast layer; erupted third molar (×400) in patient aged 23. Erythrocytes appear to be extravasated into the dentinal tubuli, but this is doubtful because of the length of the diameter of the dentinal canaliculi (1 to 3 microns). This is the type of hemorrhage which Hellner feels is often due to effects of procaine-epinephrine anesthesia on the blood vessels of the pulp. D, dentin. D_1, dentinoid. O, odontoblasts. P, pulp. H, hemorrhage. E, erythrocytes.

embedded. The normal vascularity of the pulp is Grade 2, but Grade 1 indicates the normal amount of fibrous tissue.

The arterial blood supply to the pulp ends in a plexus of capillaries, continuous with venous capillaries, in the tissue subjacent to, and between, the odontoblasts. Figure 4 shows a capillary hemorrhage in this area of the dental pulp. The abundance of these capillaries can be graded, just as was the general vascularity of the pulp. Grade 1 indicates that only a few capillaries are present; Grade 2, that an average number of capillaries are present, and Grade 3, that there are more than an average number.

From the results noted in Table 10, the two groups of teeth check almost exactly in Grades 1 and 2, but it is interesting that 6.2 per cent of the seventy-nine embedded teeth had more than the average number of capillaries in the tissue near the odontoblasts, whereas in none of the erupted teeth was such an abundant capillary supply found. It is not possible to determine definitely by an examination of the subodontoblastic capillary blood supply whether a tooth is embedded or erupted. However, an unusually abundant capillary network was seen in this study only in embedded teeth.

By calculating the average age of the patients for each grade of capillary bed (Table 11), it was found that the results uphold the statement that, with increasing age, there is a decreased blood supply to the pulp tissue.

It is generally agreed that there is no mucin in the dental pulp. In the present study, sections from seventy-six teeth were stained with the Galantha mucin stain. In not one of the specimens, from either embedded or erupted teeth, was it possible to demonstrate the presence of mucin.

By means of a micrometer attachment, the width of the following structures was determined: dentinoid layer (uncalcified dentinal matrix), odontoblast layer and zone of Weil (cell-poor subodontoblastic layer [Fig. 5]). Measurements were determined for each layer in three different parts of the pulp cavity of each tooth, as follows: roof of the pulp chamber, lateral wall of the pulp chamber and upper third of the root canal. Sections from forty-seven decalcified teeth were

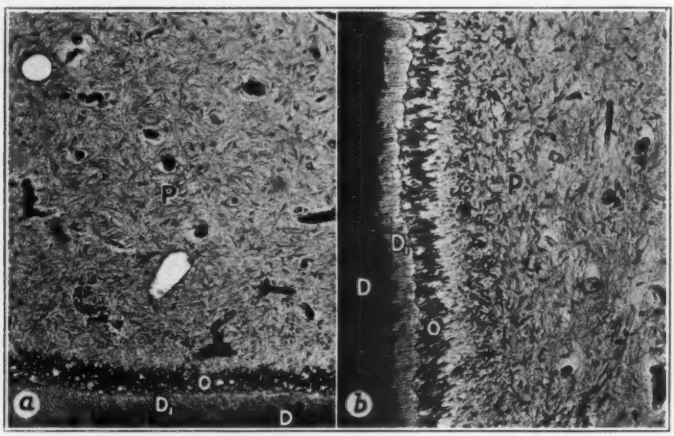

Fig. 5.—a, embedded upper right third molar (×170), showing cellular density, Grade 2; fibrosis, Grade 1; vascularity, Grade 2. b, erupted lower right third molar (×170), showing cellular density, Grade 2; fibrosis, Grade 1; vascularity, Grade 2. These photomicrographs are of pulps from two teeth extracted from a patient aged 23. D, dentin. D_1, dentinoid. O, odontoblasts. P, pulp.

measured. This gave 141 measurements for each layer. The figures were averaged for each of the three layers (Table 12).

The three layers measured are greater in width by 13 per cent, 22 per cent and 16 per cent, respectively, in the embedded teeth than the corresponding layer in the erupted teeth. The lesser width of the layers in the erupted teeth may indicate a lessened activity as regards dentinification.

SUMMARY

Histologic sections of pulps from 152 third molar teeth, embedded and erupted, were studied. The cellular density of the stroma of the dental pulp was equal in the two groups. The amount of fibrosis was very similar in the two groups, and fibrosis increased with age in both the embedded and the erupted teeth. Inflammation was rare in both groups, but did occur more frequently in the pulps of erupted third molar teeth than in those of embedded third molars. Calcification of the pulps was common in both embedded and erupted third molar teeth. The vascularity of the pulp was approximately the same in the two groups, and decreased as the age of the patient increased. No significant difference in the capillary blood supply was found in the two groups of teeth. In neither group was it possible to demonstrate mucin in the pulp tissues. From forty-seven decalcified teeth, 141 measurements for each of three structures (dentinoid layer, odontoblast layer and zone of Weil) showed that the widths of the three layers were slightly greater in the embedded teeth than in the erupted teeth. These differences were not of sufficient magnitude, however, to serve as a basis for determining whether a tooth was embedded or erupted.

The results of the present study indicate that it is not possible, by histologic examination of their pulp tissues, to distinguish between embedded teeth and erupted teeth.

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WAR ORAL SURGERY

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THE dogs of war are loosed again! Intelligence has learned nothing from the madness of the first World War to "end all wars." And while the dictators and politicians are playing their game of greed, hundreds of thousands are dead and as many cripples again fill the earth.

It is our part to patch up the innocent victims and to restore them, if not to renewed efficiency, at least to a faint resemblance of their former selves. Our task has become infinitely complicated with the refinements of the mechanical and chemical means of total or partial destruction which man has devised against his fellow man, his innocent antagonist.

EARLY DATA ON MILITARY ORAL SURGERY

In Napoleonic times, there was a slogan that an army travels on its belly; but long before the Russian débacle, English history reports Woodall, the principal army medical adviser, mentioning, in 1617, the handicap of dental inefficiency and the need for inclusion of dental instruments in the medical outfit for war.

The first army dental outfit was authorized July 10, 1626, and was used in the war against France.

Just to point out a few highlights: In 1676, the first mention was made of a jaw wound and the construction of a prosthetic appliance for its treatment.

In 1816, a report of faciomaxillary injuries incurred at Waterloo was issued.

In 1821, the first dental standard for recruits was established.

In 1830, the number of troops hospitalized because of odontalgia was published.

In 1858, a list of dental filling instruments was issued.

In 1860, a course of dental surgery was included in the curriculum of the Army Medical School at Nutley. Since the formation of the British Dental Association in 1880, there has been constant agitation for army dentistry, but without success.

RECOGNITION OF THE NECESSITY OF DENTAL ATTENTION IN WAR

In 1900, Mr. Newland Pedley, of Guys, marked a milestone in army dental history when, at his own expense, he took a dental clinic to South Africa in the month of February, working at the Imperial Yeomanry Hospital at Deelfontain. Though, besides him, four contract dentists were appointed to the army in South Africa, little was done until about a year after the outbreak of the World War, by which time the dental wastage had been enormous. The dental condition of the British troops by November 1914 was shocking. The appalling increase of cases of Vincent's infection (trench mouth) and the gastro-intestinal epidemic of 1915 finally brought a recognition of the necessity for dental attention.[1]

These few data mark the dental history of every belligerent country. Neglect, neglect, until dire necessity demanded not only remedial measures, but also preparedness.

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THE UNITED STATES OF AMERICA

America's measures for dental organization are outstanding and fairly well known to all of you. The purpose of this discussion is to point out some of the problems that have just recently arisen and to bring to realization the share that we should shoulder in our capacity as dentists and oral surgeons under conditions that have materially changed, even since the last World War.

The literature of America's outstanding contributions to dental war surgery is so widely distributed through our journals that cooperation in seeking out and selecting a favorable subject for practical reports seems absolutely necessary.

FRANCE

The French have three volumes edited by Henri Villain, but they too are not systematized.[2]

GREAT BRITAIN

The British, in addition to their magazine publications covering the first World War, are again publishing some interesting articles concerning organization methods in treatment of war injuries of the head and jaws. Many of the old war articles have been reviewed by me in the *Dental Cosmos,* including quite a number of French, German and Japanese monographs. An excellent book appeared in 1918 in the Oxford Medical Publications under the name of Dunlap Pearce Penhallow, "Military Surgery."

I should also refer to J. B. Hayes' articles in the *Dental Cosmos* and the *British Dental Journal,* 1916, and especially to the recent excellent articles by W. Warwick James on "Maxillo-Facial Injuries in War" in the *British Dental Journal,* October 2 and 16, and November 1 and 15, 1939.

GERMANY

The Germans, in their usual efficient manner, and anticipating the inevitable results of economic rivalry, as early as 1900 published books on war injuries of the head and jaws. Their military dental departments were organized even in those early years. H. Schroeder, in 1911, published a book on "Fractures and Luxations of the Maxillae," entirely a war injuries monograph, and again in 1914, in collaboration with F. Williger, one on "Dental Aid in the Battle Field," and "Care of Jaw Cases in the Field and at Home." I have had no access to the latter, being stupid enough to believe that the "War to End All Wars" had really been fought.

STATISTICS ON JAW INJURIES

Injuries of the head (apart from those produced by falls; auto accidents; blows from fists, bats or horses' hoofs, or revolver shots from short distances, which we may well classify as routine peace injuries) under actual war conditions comprise overwhelmingly those of the jaws, especially the mandible. The percentage of jaw injuries in the Revolutionary War amounted to 60.6; in the Sino-Japanese War, from 40 to 60. The mortality in the Crimean War amounted to 46.9 per cent; in the Civil War, to 8.1 per cent, and in the Franco-Prussian War, to 9.3 per cent. In the last case, it is worthy of note that after gunshot injuries of the lower jaw, fatalities in base hospitals were far less numerous than those recorded in field hospitals, where tetanus, pyemia, hemorrhage, etc., took their toll.

Hashimoto, in his clinicomilitary report concerning the East Asiatic War, published in the *Archiv für Klinische Chirurgie,* 1908, lays particular stress upon the necessity for special treatment of mandibular gunshot wounds, stating that "loss of mandibular function is the most tragic war injury."

A great deal of valuable experience in surgical treatment of mandibular gunshot wounds was gathered in the Greco-Turkish and the Greco-Bulgarian Wars,

1912-1913, which were graphically described by Franz Goldammer in *Beitraege zur Klinischen Chirurgie,* volume 91.

Again, some time before that, Williger, Schroeder, Bruns, von Ilberg and others had gathered practical surgical data by testing the effects of directing various missiles at cadavers from various distances and under varying conditions (1897-1898).

PREVALENCE OF MANDIBULAR INJURIES

From all of these theoretical and practical observations, at least one fundamental fact was established: that the portion of the head most frequently destroyed is the mandible, the lesions of which usually involve extensive loss of hard and soft tissues and an appalling variety of complications, which call for every imaginable surgical means of repair.

All gunshot injuries of the jaws are punctures, contusions, lacerations and those of the penetrating and comminuting type, usually involving considerable loss of tissue substance. Owing to their hardness, the jaws, especially the mandible, may be hit from two to four or even more times by the same ricocheting bullet.

BALLISTIC OBSERVATIONS

The modern types of so-called "humane" ammunition determine in large part the nature and extent of jaw injuries and their surgical treatment. Even the greenest recruit quickly learns to distinguish between the dumdum, the spinner, the whistler, the cross-hit, etc., even though he may "nick" his own bullets so that they may serve as a surer death salute.

The jaw wounds that we are called on to treat vary according to the types of bullet, types of rifle, initial velocity, trajectory, powder charge and distance. Close shots, as in suicides and gun fights, and from gangsters' spray guns, etc., teach the war oral surgeon practically nothing, even though considerable portions of the jaws may be carried away.

War gunshot wounds indicate the type, caliber, direction and distance of the rifle that fired the shot, almost as accurately as a finger-print identifies its owner. Steel or German silver jacketed bullets fired from a medium distance in rare cases produce one clean-cut, simple perforation and fracture. As a rule, however, owing to the lead core in modern bullets, which results in spreading of its nose, the comminution of the bone and soft tissue is greater at the exit than at the entrance of the bullet. The soft tissue at the exit usually resembles a broad rosette, inevitably infected after passing through the oral cesspool.

The projectiles from rifles, revolvers and machine guns, as used in the last World War, did not greatly differ in their motion of projection, rotation or oscillation, since very soon all of the belligerents followed the example of using dumdum and nicked bullets. These artificially deformed bullets and ricochets naturally greatly complicated the oral surgeons' task. German S bullets, Austrian Mannlichers, French D types, English cylindro-ogival types and U. S. Army types were all mutilating. What type of homicidal confetti will be distributed this time is a cautiously guarded secret. The modern American repeating rifle has an ominously effective reputation preceding it; and what of the still more or less carefully guarded machine guns of the other nations? Each offers a new problem to the oral surgeon.

Projectiles from artillery, high explosive shells and shrapnel, gas shells and tear shells, anti-aircraft guns, all offer their own surgical problem. Their fragments are usually large, and spattered soil and stones and other fragments act as secondary projectiles, complicating the surgeon's task. Grenades, bombs and mines produce their own types of jaw injury, resulting from a combination of

large or small outside fragments, bullet and metal scrap contents, soil, sand and stone projectiles, with traumatic results varying with the distance the hand grenades are thrown, their make (oyster, stick or egg bomb type, rifle grenade, Mills' bombs, plum pudding type) or the angle at which they hit the recipient at the parapet or in the trench. An exploding mine, of course, coming from below is no respecter of any physical or humane law of symmetry of injury.

Flammenwerfer (portable flame projectors), French steel darts released from airplanes and the unbelievable variety of explosive confetti thrown from bombers, etc., present entirely new problems to the oral surgeon.

Nor should we disregard the various types of head and jaw injuries incurred in naval battles with all the fragments of steel, deck and below-deck junk flying about and hitting heads, and the injuries from submarine attacks, which have a manner all their own.

CIVILIAN INJURIES DURING WAR

It is not the enlisted portion of the population alone under military discipline that concerns us. Airplanes often, let us hope unintentionally, "strafe" innocent civilians, either out in the open or in refuge stations. Of the bomb-proof shelters, many will prove to be unsafe, and the injuries incurred in them offer new problems. The trenches have been brought home; and a panicky civilian population with no experience as to military discipline requires special treatment, especially during a gas attack, when the oral surgeon cannot dispense with a gas mask for himself or his patients.

Therefore, we should have a profession sufficiently prepared to take care of civilian casualties as well as military exigencies. The men called upon to take care of the latter cases are even now duly enlisted and compensated, with an enviable prospect of a pension. The nonenlisted civilian dentist drawn into service in case of general or partial mobilization also should be duly compensated. Moreover, his service should not be entirely withdrawn from civilian life; for today's fathers and mothers, if kept dentally healthy, will produce tomorrow's dentally healthy fighting force.

TRAINING COURSES SUGGESTED

As prospects appear now, it would seem advisable to have all dentists of suitable age and physique enlist at proper intervals and with proper pay in a training course that would acquaint them with:

1. The most necessary military routine discipline.

2. Dental routine and like procedures, such as distribution of cases to the various available hospitals; setting up, packing, tenting and transporting dental equipment; selecting dental stock and stores of proper quality and quantity, and keeping track of sources of supply, prices and correct utilization—in short, knowing something about military bookkeeping and auditing.

3. Hygiene and sanitation, sufficiently well to protect the field forces as well as the civilian population at home and in occupied territories (water supply, disposal of wastes, camp and home sanitation, epidemics, foods and their preparation, disinfection of clothing, etc.). A valuable book on this subject has been written by Keefer.[3] Although under present American Army and Navy rule, most of these functions are taken care of more or less routinely, by not necessarily efficient or well-advised departments, with a great deal of delay, what if discipline should weaken or emergencies should arise? Who will fill the gap? Just one recent illustration: The Spanish Civil War!

Education of the type proposed here would not be fully efficient, if the cooperation of dental technicians and dental nurses were overlooked. Without the dental technician, the construction of

splints, obturators, plates and orthopedic appliances would be impossible; and without the specially trained dental nurse, an undue amount of the oral surgeon's valuable time, and the patient's comfort and chances of speedy recovery would be wantonly sacrificed.

THE DENTIST VS. THE PHYSICIAN

Courses on reconstruction under the tutelage of brain, bone, orthopedic, eye, ear, nose and throat specialists are indispensable, if skilled, efficient and tactful cooperation between medical and dental men is to be achieved. A fair, cheerful spirit of camaraderie, of give and take is the basis of professional morale. As A. H. Parrott, in a communication on "Wartime Emergencies," in the *Dental Record,* September 1939, expresses it, with rare English wit:

> The emergencies of war-time injuries may knock the heads of combatants and civilians apart, but will also speedily knock the heads of the surgeon and dentist together. The one axiom I want to stress more than any other is this: That, ignoring all other forms or regions of injury or disease, jaw cases should be considered as dental cases primarily and as surgical cases secondarily. . . . The surgeon, however skilled he may be, will not, if he is also wise, attempt surgical treatment on a shattered face or jaw, until he is assured that the oral cavity has been dealt with first and put in as favorable condition as possible, before he attempts surgical manipulation on the external parts. . . . My own experience at the First Southern Command Center (during the Great War) was that of many other colleagues. The surgeon in charge said, "These are my cases, I will call you in when I want you." The result was lamentable; surgical operations were performed without regard to the severe internal sepsis due to broken teeth, bone fragments, etc. and case after case went backwards and brought a string of unnecessary complications and problems in remedying the primary dental neglect with it.

Team work of surgeon and dentist for the complete treatment of jaw cases calls upon other branches: radiography, anesthesia, bacteriology, photography, bone and skin grafting and skilled mechanical dentistry. Both professions can profitably learn from cooperation in these fields, during war even more than they can in peace.

PEACE VS. WAR CASES

For training, of course, we can use only peace cases now; but civilian jaw injuries incurred in accidents connected with automobiles, airplanes, machinery, explosions, riots, strikes, conflagrations, tunnel building, building construction, etc., down to plain fist and bottle fights, bear some resemblance surgically to accidents with autos, lorries, tanks, planes, ordnance, trench, barracks, mine construction, flame throwers, etc., down to the billy, double-ended slash dagger and hand bombon of the mopper-up, the "nettoyeur."

The special requirements in the treatment of gunshot wounds contracted under war conditions have been pointed out. Each case seems to require individualization in treatment such as no textbook on oral surgery can comprehensively and adequately cover; but all of these cases demand and deserve the most skilful treatment.

What makes our task more complicated is the fact that the aim of modern war strategy is not so much to kill, but to maim, to engage the labor of from ten to twenty men to carry the injured man from the front back to the base hospital and render these aids useless for any but rescue work.

In passing, it should be mentioned that had it not been for local anesthesia, rendered possible by a German chemist's discovery (Einhorn's discovery of novocain), wars would be much shorter and repairing tasks much more complicated, with the senseless waste of men and mice really effective.

Let us hope that we may not be called upon to restore these hapless cases but—let us be prepared!

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WHAT RÔLE CAN THE DENTIST PLAY IN THE PREVENTION OR CORRECTION OF SPEECH DEFECTS?

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THOSE of us who are interested in children's speech are dependent, for success in our work, on the cooperation of our fellow workers in other fields. Many of our problems are concerned directly with the dentition and oral hygiene of our patients. We are able to work only after the dentist has paved the way for us.

Perhaps one of the best ways to indicate the rôle that the dentist may play in speech hygiene is to discuss briefly the speech process, with particular reference to the development of speech in the individual.

We have no instinct for speech: we develop speech. We learn to talk exactly as we learn to do anything else; exactly as we learn to swim, roller skate or drive a car. Speech is a learned response. In addition, it is a very complicated response, requiring a great amount of learning. It is one of the biggest jobs that the child faces in his developmental history.

The organs which we use for speech are, biologically speaking, for other purposes. The lungs are used for respiration and, to provide the proper breathing for speech, the muscles which activate the lungs must take on entirely new functional patterns. The larynx is primarily a valve and a protector for the respiratory tract, not a producer of tone; and the entire articulatory mechanism, the tongue, lips, jaws, teeth and palate, are for chewing, sucking and swallowing, and not for articulatory purposes. The human being employs these organs for the function of speech. To do this requires a complicated nervous system; a nervous system of the complexity only of that of the human being. Consequently, the infant can develop speech only when he has a sufficiently complex nervous system to make the finely coordinated movements of speech. Thus, one of the requisites for good speech is an adequate nervous system.

Each child learns to speak by imitating what he hears around him. The infant, in his babbling, gurgling and other sound-making activities, will produce an almost endless number and variety of potential speech sounds. Out of this repertory of sounds, he will select those which he hears used in his neighborhood and also those which "get results." For instance, one of the earliest things that the infant does is to open and close the mouth. If he does this and happens to make a laryngeal tone when the mouth is open,

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he "says" *ma-ma.* Nice things happen to him when he makes this sound, and so he quickly fixes it. It "gets results." Similarly, with the sounds which he hears: he will select from his entire repertory of possible sounds those which people about him use, and this is the reason that we have regional dialects, family voices, provincial pronunciations and the like. The child quite unconsciously imitates what he hears. A child reared in the United States will speak English; one reared in Germany will speak German, and one reared north of the Arctic Circle will use one of the many dialects of the Eskimos.

Therefore, a second requisite for good speech is good models; but an adequate nervous system and good models will not assure adequate speech unless there is a normal physical structure. If the larynx, mouth and nose are structurally anomalous, good speech sounds cannot result. The larynx, of course, is concerned almost solely with the production of the voice for speech; but the mouth cavity, with its attendant structures, produces the articulate sounds of speech. It is in the mouth and nose that the sounds produced in the larynx are molded and articulated into the elements of speech. Thus, any anatomic irregularity in the mouth area is apt to cause inaccurate, if not unintelligible, speech. Both vowels and consonants are influenced by the shape and structure of the mouth cavity.

Speech is a learned process. It is learned by every child in the course of his progress toward adulthood. For its learning, there must be an adequate nervous system, good models and a normal mechanism; and it is with the last that we are concerned primarily in our consideration of what the dentist may do toward the prevention and cure of speech difficulties.

In other words, the first rôle that the dentist can play in the prevention or cure of speech difficulties is that of being a dentist. Perhaps an enumeration of specific speech difficulties rising from certain oral malformations will be of value. The conditions of interest are the following: defective or imperfect dentures, deformities of the jaws, misshapen palatal arches and last, but most difficult of treatment, cleft-palate.

The teeth, although they may be passive, play an important part in speech. They serve as barriers to the outgoing breath stream and thus set up eddies in the air which are interpreted as meaningful speech sounds. If there are wide gaps, or if the teeth are irregular, the tongue cannot regulate the degree of closure, and sound substitution results. The sounds most affected are the *f* and *v,* the initial sounds in the words *thin* and *thine,* and the sibilant *s,* particularly the last sound. With teeth that are badly formed, these sounds are always defective, even at their best, and short of understandable at their worst.

Deformities of the jaw cause considerable trouble. The undershot jaw protrudes the lower lip beyond the plane of the upper teeth and prevents proper closure for such consonants as *f, v, w, m, p* and *b,* and vowel sounds, *ah* as in *father* and *o* as in *no.* The overshot jaw likewise prevents proper closure and influences all the above sounds, with the addition of *s, z, sh* and *zh* and combinations of these. The open bite affects all sounds except the open vowels and possibily *n* and *ng.* Nearly all sounds are affected by these irregularities of the jaw, and good speech must wait for the relief of the structural difficulties.

In the case of cleft-palate, good speech is impossible without surgical aid. The condition influences not only the vowels and the consonants, but even the quality of the voice itself. There is no way to close off the nasal cavity, and, consequently, the mouth cannot form the speech sounds demanded of it.

Hence, the dentist must function first as a dentist and restore normal structure.

Normal speech depends on normal structure.

In the second place, the dentist may with profit observe any instances of incorrect speech in the child and report them to the parents. Frequently, parents are accustomed to the speech of the child and do not notice the deviations. Further, the parents often have deviations in their own speech of which they are unaware, and these are copied by the children. Pronounced lisps, for example, will sometimes show up generation after generation in the same family. Incomprehensible as it may seem to us, occasionally children are encouraged in deviated speech because their parents think it is "cute" or charming. Need I mention that each of us should use all of his power of prestige with parents to break down any ideas of this kind?

Any observation of speech defects should go beyond the individual sound itself. Frequently, individual and isolated sounds are made apparently correctly, even though the oral cavity is structurally imperfect. In other words, the individual with an imperfect mouth structure may attempt to compensate for that structure by unusual and strenuous muscular activities; that is, by overuse or wrong use of the tongue or by exaggerated movement of the lips, he may be able to produce an isolated sound correctly. He attempts to make a right from two wrongs: a wrong structure and a wrong functioning of the muscles to make a correct sound. A situation of this kind, however, leads to endless difficulties in connected speech.

Ordinary conversational speech requires a large number of successive sounds and consequently a large number of finely coordinated movements and placements of the articulatory apparatus. In the evolution and development of speech, only those combinations of sounds which are easily formed have survived. Consequently, although an individual sound can be made by itself by extreme muscular adjustment, it cannot be produced easily in connected discourse unless the articulating organism is normal. Any judgment, therefore, concerning speech difficulties must be made, not on the individual's ability to produce isolated sounds, but on his production of sound combinations rapidly and accurately in connected speech. This cannot be done if the dental mechanism is not structurally correct.

INFLUENCE OF FUNCTION ON STRUCTURE

Of further interest here is the influence of function on structure. We know that muscle tension and the pressure of softer parts cause definite changes in the shape and form of harder areas and of the bones. The sad story seems to be that when attempts are made to compensate for a dental anomaly by exaggerated and abnormal muscular activity, the result may be only exaggeration of the dental deformity and increased difficulty. Consequently, the dentist should be on the lookout constantly, not only for speech difficulties in isolated sounds, but also for cues to abnormal functioning of the entire articulatory apparatus.

A third thing that the dentist may do toward the cure of speech difficulties is to send the child for examination and treatment by a trained and competent speech correctionist during and after any dental adjustment. In the absence of retraining of the speech musculature, correct speech does not develop, even though the structure may have been restored to normal. No person, young or old, automatically and spontaneously assumes correct speech habits following a dental adjustment. Muscle habits have been set up which are adapted to the earlier condition. These will not be eliminated except through specific retraining; and the best and most efficient way of correcting these muscle habits of speech seems to be in speech itself.

There is a further implication in this of which you all are aware: if these

muscles are not retrained, and if the old habits are allowed to persist, the adjustment is extremely unlikely to be permanent. Again I refer to the influence of function on structure.

A further consideration is involved here: No one of us hears his speech as it actually is. All of us are quite accustomed to our own speech sounds. To us, they seem standard, although they may deviate widely. That is why a person of foreign birth speaks a dialect of the English language: German dialect, French dialect and the like. To the person of foreign birth, the English that he is using, however it may sound to us, sounds to him like standard English. The same thing happens to a person with a speech defect arising out of a previously existing dental deformity. He simply does not hear the defective sounds. Outstanding as they may seem to us, he is quite unaware of them until his ear is trained to recognize them.

Combine, then, a strong fixation of previous habits with an inability to recognize correct sounds, and it is not difficult to understand why a patient should be sent for examination and treatment by a competent speech correctionist during or after any dental adjustment. We are particularly aware of this, of course, in the case of cleft-palate; but the same principle holds whenever there has been a change of structural conditions in the speech areas.

One final thing that the dentist may do to help clear up speech difficulties in children is to combat a rather prevalent idea that children will outgrow speech difficulties. Far too often the dentist says to the parents, "Oh, don't bother with that—he'll outgrow it." This is pernicious advice. Occasionally, children do outgrow speech difficulties, and this gives slight grounds for the prevailing opinion; but, statistically, the chances are against outgrowing the difficulty. Any speech difficulty, any marked deviation from standard speech, persisting past the age of 5 or 6 should receive definite attention. Obviously, children will vary in the speed and skill with which they pick up speech. Allowances must be made for this. But those who have seen the constant stream of adults in speech clinics know that children do not "outgrow their speech difficulties." For the sake of the future happiness and social adjustment of the child patient, the dentist should use all of his influence to convince parents that children do not outgrow their speech difficulties. Statistically, the chances are definitely against a favorable outcome.

PREVENTION

So much for the things that the dentist may do to help in overcoming speech difficulties in children; and now a few words as to prevention. What can the dentist do to prevent speech difficulties in those children that come under his care?

In the first place, he can definitely discourage the use of baby-talk or imperfect speech of any kind on the part of the parents. Remember that the child, in learning speech, is selecting his sounds from what he hears. Any use of baby-talk in the home simply complicates the child's task needlessly. He must learn the baby-talk word and the adult word for too many things. It is no kindness to the child to put him to this extra labor. If this were all, however, we should not be so vehement in condemning it; but it is not all. We find infantile speech habits in too many adults to condone baby-talk in the home. These habits become fixed at an early age and, once fixed, are difficult to eradicate. This we have seen earlier in the paper. Why do parents needlessly complicate the learning processes of the child and take the chance of persistence of these infantile speech habits into adult years?

Again, we can prevent speech difficulties by making necessary dental adjustments and repairs as early in life

as possible. Early repairs frequently will prevent the fixation in the nervous system of abnormal habit patterns that can be eliminated later only with great difficulty, if indeed at all. Early repair will allow the normal processes of growth as great opportunity as possible to operate during the development of speech to produce normal structure and function. Lastly, early repair is important in order to bring to normal the physical appearance, as early as possible, and thereby prevent the self-consciousness that comes from physical blemishes. Therefore, adjustments should be made as early as possible.

The dentist has yet another rôle in the prevention of speech difficulties, a rôle which lies quite outside the adjustment of the articulatory mechanism itself. He contributes to the improvement of the facial appearance of the patient. Any child is strongly gregarious, exhibiting a marked fear of seeming different from the rest of his group. It is quite possible, for example, that malocclusion may have just as great an effect on speech psychologically as it has physiologically.

Speech itself is a highly complicated and highly integrated act. It is one of our latest acquired evidences of skill and consequently is one of our least stable accomplishments. We are all quite familiar with the fact that we lose speech facility, that we display all kinds of speech abnormalities when we are embarrassed, self-conscious or emotionally disturbed. Emotional upset of any kind is apt to destroy the delicate integration of the speech musculature, so that we show speech disturbances. With most of us, this is an infrequent and certainly a transient occurrence. The person with unattractive facial contours, however, or the one with poor dentition is constantly aware of his appearance. This self-consciousness, this overawareness of physical appearance, with all of its attendant compensations and stresses, may lead to definite speech difficulties.

This is particularly true of deviations in the facial area. Speech definitely attracts attention to the speaker's face. We look at people when they talk to us, and since our attention is on the speaker's face, he becomes even more acutely aware of any deviations from a normal physical appearance.

Our case histories are full of instances wherein speech difficulties apparently arise from faulty dentition, and malformed jaws and abnormal facial contours must be listed as psychologic factors in speech disorders.

The desire for good speech and adequate social adjustment adds to the evidence in favor of early dental adjustments.

Although it is difficult to distinguish between the prevention and the cure of speech difficulties, I have chosen to separate the two in the presentation of this paper. The dentist may play a tremendously important part in overcoming speech difficulties by providing a normal speaking mechanism. Second, he may observe incorrect speech and report it to the parents and to the child himself. Third, he may send postoperative and postadjustment cases to competent speech correctionists for examination and treatment. Fourth, he should emphasize, with every bit of persuasive force he has, that children do not outgrow speech defects. For prevention, I have suggested that you might discourage the use of baby-talk on the part of the parents; make dental adjustments as early as possible, and maintain a normal facial appearance in the patient.

Good speech is a social and economic asset, as well as an esthetic satisfaction. Our civilization is based primarily on speech. Our whole social structure is built as it is because we can talk to our fellowmen. Good speech is necessary for social adjustment and success—ample reason, certainly, for every dentist to be interested in the speech of the children who come to him as patients.

DEVELOPMENT AND ETIOLOGY OF THE DENTIGEROUS CYST

By WILLIAM BAUER,* M.D., St. Louis, Mo.

THE so-called dentigerous cysts are cavities of various size in the jaws outlined by an epithelial layer and containing one or more imperfectly developed teeth. This epithelium consists, in the majority of cases, of squamous cells and rarely of cylindrical cells. The cysts, which contain a viscid brownish fluid in which are suspended cholesterol crystals, demonstrate no relation to the overlying deciduous tooth. Some investigators do not limit the definition of the dentigerous cyst within the strict sense of the word, but describe toothless cavities in the jaws also as dentigerous cysts. Referring to my former histologic investigations, I would distinguish between cysts containing a more or less developed tooth or teeth and toothless cysts, only the former being called dentigerous cysts.

This division can be further supported by differences in development of the two. I considered that the toothless epithelial bordered cyst of the jaw which is not connected with teeth, and which originates from the epithelial remains in the periodontal membrane, or in the bone from inflammatory or traumatic processes, should be called paradental cysts. It is believed that these cysts represent a special group of rarely observed cysts or an early state of the ameloblastoma. I contend that only the common radicular cysts and the dentigerous cysts in the group of benign cystic growths of the jaw can be definitely and clearly separated etiologically from the other group of cysts in the jaw, in whose development there are only smooth transitions.

Brocca supposed that the dentigerous cysts take their origin from the tooth germs. Disturbances in the early stages of tooth development, when the teeth are not yet calcified (embryoplastic period), may result in a toothless dentigerous cyst. Disturbances in the later stages of development of the dentin and enamel (odontoplastic period) may result in a dentigerous cyst containing an unerupted tooth.

Malassez, on the other hand, announced his belief that dentigerous cysts originate from the epithelial débris in the periodontal membrane and that more or less developed teeth are later enucleated within the cyst cavity.

Later writers confirmed the theory of Malassez or of Brocca, their conclusions depending on each individual's line of thought. However, none could come to a scientifically substantiated conclusion because only well-developed dentigerous cysts were observed and only by chance was it possible to study the histologic development of dentigerous cysts in the germinal stages in connection with the surrounding hard and soft tissues. An accidental discovery gave me the opportunity to observe such a case and to describe the development of a dentigerous cyst, with microscopic evidence.

The mandible of a girl aged 7½ years who had died of diphtheria was removed and histologically examined. Although the mandible did not manifest any swelling, a developing dentigerous cyst was discovered through routine histologic in-

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vestigation. The area involved was beneath the lower left deciduous lateral incisor. The right permanent incisors and the permanent left central incisor had erupted. The deciduous left lateral incisor was carious on the distal surface. Unfortunately, roentgenographic examination of the mandible was omitted. The labiolingual sections made through the jaw exposed a cavity extending from about the inferior border of the mandible to the superior border. The cross-sections of this cystic cavity were 3 and 1.5 cm. in diameter with the superior aspect unsupported by bone.

Fig. 1.—Labiolingual section through mandible of child, aged 7½, showing dentigerous cyst containing bud of left permanent incisor; tangential section of overlying left deciduous incisor.

The first sections through the cyst, showing the tangentially cut deciduous lateral incisor, demonstrated a tooth crown in the depth of the cavity the root of which was about 2 mm. long and embedded in the surrounding connective tissue. The diagnosis of dentigerous cyst was established by virtue of this finding. (Fig. 1.)

In the following series of sections, the crown of the included permanent tooth could not be seen, whereas the root of the decidous tooth next to the tip of the cyst was manifest. (Fig. 2.)

The sections showing the relationship between the apical area of the deciduous tooth and the cyst play an important rôle in determining the genesis of the dentigerous cyst. An actual connection between the cyst cavity and the apical area of the overlying tooth could not be found in any series of sections.

MICROSCOPIC FINDINGS ON THE PERMANENT TOOTH GERM EMBEDDED IN THE CYST

In the decalcified sections, only small sections of enamel were visible. The dentin was fairly well formed and covered in its short root portion by a thin layer of cementum on the surface of which lay cementoblasts. Along the cementum, remnants of Hertwig's sheath were demonstrable, accompanied by dilated blood vessels. The apical portion of dentin was deflected from the alveolar bone by a layer of newly built bone containing large cells. The pulp tissue in the inferior two-thirds of this tooth was intact, but, in the upper one-third, a typical atrophic process was active, the so-called "reticular atrophy" of the pulp. This atrophied region is sharply demarcated from the unaffected tissue. The odontoblasts disappeared, being replaced by a dense network of connective tissue fibers. The inner tissues of the pulp were edematous. The enamel epithelium did not envelop the crown from the cemento-enamel junction, as is sometimes found in unerupted teeth, but was detached by a very large blister forming an epithelial-lined cyst extending from the lower border of the mandible to the upper border. Only small parts of this epithelial layer

gave the opportunity for recognizing the former epithelial layer, because it was flattened by pressure of the cyst contents. Some papillary projections protruded into the surrounding connective tissue, which was marked by inflammatory infiltration. These projections of the epithelial layer are particularly striking in the surrounding area of the apical region of the overlying deciduous tooth. This important finding will be discussed later.

Fig. 2.—Labiolingual section of dentigerous cyst (Fig. 1) showing relationship between cyst and chronic periapical inflammation of deciduous incisor. C, cartilaginous and fibrous callus within bone.

The cyst contained a dense exudate with destroyed epithelial cells and cholesterol crystals. The exudate was surrounded by a thin membrane from the space of the lost enamel by decalcification of the specimen. Without doubt, this membrane is the enamel cuticle. This statement is important as regards the question of development of a dentigerous cyst.

MICROSCOPIC FINDINGS ON THE TISSUE SURROUNDING THE DENTIGEROUS CYST

The connective tissue around the cyst cavity and between the deciduous teeth and cystic cavity was altered by inflammatory processes which were very striking. In other parts of the connective tissue, the cells were with difficulty demonstrated and with difficulty stained, because of atrophy. Large edematous spaces and hyaline degeneration around the dilated vessels were found. The surface of the surrounding bone was covered by osteoblasts laying down new bone, but, on the labial side, resorption of bone by active osteoclasts was clearly seen. This finding is evidence of growth of the dentigerous cyst toward the lingual surface.

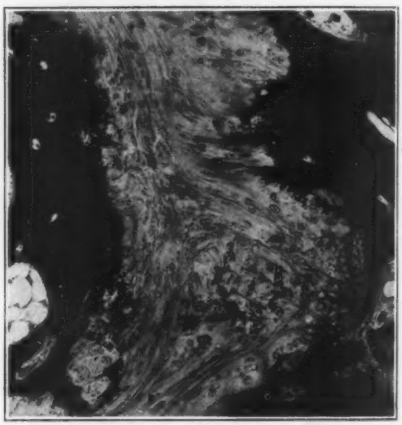

Fig. 3.—High magnification of cartilaginous and fibrous callus formation (Fig. 2) containing detritus of bone and blood.

MICROSCOPIC FINDINGS ON THE DECIDUOUS TOOTH

A small cavity was found on the crown. On the lingual side, the epithelial attachment is located on the cemento-

enamel junction; but, on the labial side, the floor of the gingival crevice is located on the root surface about 2 mm. below the cemento-enamel junction. Here, the cyst cavity extended almost to the subepithelial tissue of the gingiva and was separated from the deciduous tooth only by a wide strip of connective tissue. The surface of the root of the deciduous tooth was resorbed during the development of the cyst so that only a thin strip of dentin was found between the pulp and the cyst wall. Resorption was going on here and there in this area and the resorption area was filled in by the apposing bone and cementum. The connective tissue between the deciduous teeth and dentigerous cyst was extensively infiltrated with round cells. It would seem that the apical condition of the deciduous tooth could be of great importance in explaining the development of a dentigerous cyst. The resorbed root-end of this tooth was surrounded by proliferating epithelium, which formed papillary projections, with central degeneration. Several epithelial columns protruded into the pulp at the extensively resorbed root-end and pulp canal, which was filled by granulation tissue. Special attention must be paid to the fact that these epithelial proliferations were connected with the epithelial lining of the cyst cavity.

MICROSCOPIC FINDINGS IN THE MANDIBLE REMOTE FROM THE CYST

As a result of the resorption and apposition of bone, the fat marrow of the marrow spaces on the border were transformed into edematous fibrous tissue which contained dilated veins, and splinters of bone lamellae traumatically produced and attached to the bone by callus formations were found.

The most striking discovery was two areas of cartilage formation in the labial bone border near the dentigerous cyst and separated from each other by rather thick bone, but separated from the cyst only by connective tissue or by a thin layer of bone. The serial sections through the mandible obviously demonstrated the communication of the upper region of cartilage with the chronically inflamed connective tissue which surrounded the cyst. Most of the cartilage cells were degenerated and showed various alterations. Besides this finding of tissue degeneration, there was also formation of new cartilage and connective tissue caused by reaction or regeneration, particularly in the encapsulated areas of detritus of hemorrhages. The mentioned callus formation showed the same alterations, but with a more striking picture of encapsulation of hemorrhages and detritus, caused by the trauma. (Fig. 3.)

COMMENT

The histologic findings of two callus formations of cartilage in the mandible of the patient in close approximation to a dentigerous cyst suggested the question whether they resulted from embryonic tissue or traumatic interference. Our knowledge of the development of the mandible is not very extensive, and I was not able to find in our present-day literature any reference to embryonic remnants of cartilage in or beside the symphysis of the mandible. Such a consideration became superfluous because the findings of callus formation associated with various changes of the soft and hard tissues would permit an explanation only of development by mechanical trauma.

The parents of the patient stated that the child had fallen about three years before and injured the chin rather seriously.

It cannot be questioned that the areas of callus formation previously described arose from infraction of the mandible caused by the fall. A complete repair of this bone damage was interrupted and impeded by undue movements in mastication, and especially by the unrest brought about by the development and

eruption of the permanent teeth. Our findings of a callus consisting of cartilage, fibrous tissue and hemorrhage are very similar to the findings under conditions of so-called pseudojoints. These areas of callus formation in the mandible were directly connected with the wall of connective tissue which surrounded the cyst. The question must be asked: Is the development of the dentigerous cyst caused by the injury which produced this callus or by the chronic periapical inflammation of the deciduous tooth? The microscopic findings in this case, together with the clinical picture and experimental investigations, explain the development of the dentigerous cyst.

Chronic periapical inflammation of the deciduous teeth is often seen; but dentigerous cysts are seldom found. Moreover, dentigerous cysts containing permanent molars or supernumerary teeth can be demonstrated more often. Although the relation with deciduous teeth in this case cannot come into the question, I would like to add that our experiments and microscopic investigations prove that periapical inflammation of the deciduous teeth damages the ameloblast layer of the underlying tooth buds, causing enamel hypoplasia and repair of resorbed enamel by cementum, but never leads to development of a cyst around the tooth bud.

It must be added that development of the dentigerous cyst in this case was no doubt caused by trauma to the mandible. The microscopic findings prove that the injury to the mandible three years previous to death probably fractured the bone surrounding the tooth germ. After the injury, transudation occurred through the enamel epithelial layer, detaching it from the enamel. This process can be considered the first state of development of the dentigerous cyst. Increase of this fluid content caused gradual increase in the size of the cyst, which, in turn, brought about a flattening of the cells of the epithelial layer, owing to pressure. The slowly growing cyst exerted pressure on the surrounding bone and thereby caused resorption of the adjoining bone by osteoclasts. There are many proofs in pathology that a transudation through an epithelial layer is possible on principle. Moreover, I was able under rachitic, scorbutic and syphilitic conditions to demonstrate in the dental capsule edema which extended through the outer enamel epithelium, separating it from the inner enamel epithelium by a blister.

It is believed that the deciduous teeth lying over the cyst were damaged by the trauma mentioned. This injury first caused a sterile necrosis of the pulp without any clinical symptoms. Later, the necrotic pulp tissue was infected and gave an opportunity for development of a chronic periodontitis, from which an inflammatory exudate extended to the wall of the underlying cyst and infected it. This infective exudate invading the outer enamel epithelium also helped to increase the fluid in the cyst. This assumption seems to be justified by the finding of particularly large projections of the epithelial lining of the cyst just opposite the root-end of the infected deciduous tooth.

SUMMARY

This is the first description of dentigerous cyst development. In the foregoing, microscopic findings regarding the development and etiology of a dentigerous cyst in the mandible of a girl 7½ years old have been described. These histologic studies were made of the growing cyst in connection with the investing soft and hard tissue. The dentigerous cyst containing the imperfectly developed lower permanent lateral incisor was caused by mechanical trauma inflicted three years previous to the death of the patient. As a result of this injury, formation of cartilage, fibers and bone took place in the surrounding tissue connected with the cyst wall. An exudate

produced by this trauma seeped between the enamel and the epithelium, detaching the first one by a blister. As a further consequence of this injury, the traumatic periodontitis of the deciduous tooth and the exudation from the infected deciduous tooth increased the cystic fluid contents.

THE USE OF SULFANILAMIDE

By PAUL O. HAGEMAN, M.D., St. Louis, Mo.

THE announcement of the discovery of arsphenamine by Ehrlich and the remarkable results which were immediately apparent from its use in syphilis focused the attention of the medical world upon the possibility of controlling infectious disease through the use of specific chemical agents. During the succeeding years, there was great activity in this field of investigation, and a large number of compounds of the most diverse sort were subjected to clinical trial. Although some helpful modifications were made of Ehrlich's original arsphenamine, and some new arsenicals and antimony preparations were found to be helpful in the treatment of certain tropical diseases, little success attended the clinical use of chemotherapeutic agents in the control of coccal and bacillary diseases. Twenty-five years elapsed between the appearance of arsphenamine and the announcement by Domagk, in 1935, that the hydrochloride of 4 sulfamido 2, 4 diamino-azobenzene (prontosil) had a marked therapeutic value in the treatment of hemolytic streptococcal infections in mice. In the same year, the Tréfouëls and their associates pointed out that para-amino benzene sulfonamide (sulfanilamide) appeared to be the effective part of the compound with which Domagk was working.

The consequences of this discovery, little noticed at the time, can scarcely be exaggerated. Already, it has been responsible for the saving of a great number of lives, and it has had a most profound influence upon the therapy of a number of extremely important infectious diseases.

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GENERAL PRINCIPLES

The therapeutic principles applying to sulfanilamide are similar to those applying to any other drug. One should prescribe that amount of drug which will cure the largest percentage of cases in the shortest possible time and still subject the patient to the least possible risk. In order to decide in any given situation whether sulfanilamide should be given, one must be familiar with its indications, contraindications and possible unfavorable reactions. With such information at hand, one should be able to make a decision. The balance of advantages over disadvantages should be unquestionably in the patient's favor before such therapy is advisable. In the absence of definite clinical or laboratory indications for sulfanilamide therapy, there is no justification for employing this chemical. On the other hand, serious reactions are so rare as not to constitute a contraindication to the use of sulfanilamide in the treatment of infections known to be favorably affected.

DESCRIPTION

Sulfanilamide is a white crystalline substance containing a single benzene

ring. It is soluble to 0.8 per cent in normal saline solution at body temperature and in somewhat greater concentrations at higher temperatures. Its taste is not unpleasant. Commercially, it is available in tablet form in two sizes: 0.3 gm. (5 grains) and 0.5 gm. (7½ grains). It is also sold in crystalline form for parenteral use. Following oral or parenteral administration, rapid and complete absorption occurs and the drug soon appears in the blood stream and tissue fluids. Sulfanilamide can be demonstrated in saliva, tears, milk, the prostatic secretion, cervical secretion and urine, and indeed in almost every secretion of the body. Approximately 95 per cent of the drug can be recovered in the urine.[3] As the drug is acetylated in the liver, so-called "free" and "conjugated" (acetylated) forms are present in the blood stream and the urine. The acetyl sulfanilamide is not an effective bacteriostatic agent.

PROCEDURES

Whenever possible, sulfanilamide should be given by mouth. Since, in the absence of intestinal lesions or vomiting, absorption of sulfanilamide from the gastro-intestinal tract is virtually complete, and since blood concentrations reach approximately the same level in about the same time with oral as with subcutaneous administration, it seems inadvisable to subject the patient to unnecessary parenteral therapy. Because of the rapidity of absorption and excretion, it is wise to administer the drug at frequent and regular intervals. This assures a more or less constant blood stream concentration. The ideal interval is four hours, but six-hour intervals are probably adequate under ordinary circumstances.

In general, the dosage for the average infection should be 0.1 gm. per kilogram of body weight a day (1 gm. per 20 pounds of body weight), with the dose divided in four or six equal parts, depending on the interval between doses. It is important that, if necessary, patients be awakened at night for medication; for the omission of a single dose may allow the blood concentration to fall below effective levels. Under ordinary circumstances, the maximum adult dose should be 5-6 gm. for every twenty-four hours. With this dosage, blood concentrations of free sulfanilamide will average about 6-8 mg. per hundred cubic centimeters, with somewhat lower figures in children. Severe infections, especially in children, justify using as much as 0.2 gm. per kilogram of body weight each day. However, dosage of this magnitude is seldom necessary in adults.

Administration of a large initial dose (as much as 0.1 gm. per kilogram of body weight) immediately on beginning treatment in severe cases has been advised, in order that the blood concentration may reach effective levels more rapidly. Under ordinary treatment, as outlined above, the blood level is stabilized in two or three days. This time is unquestionably shortened by the use of large initial doses. Originally, it was suggested that the ideal blood concentration was 10 mg. per hundred cubic centimeters. However, more recently, there is a growing feeling that concentrations of 6-8 mg. per hundred cubic centimeters are sufficient in most cases. If the drug causes gastric irritation, with nausea and vomiting, administration of sodium bicarbonate, gram for gram, with the sulfanilamide seems to decrease these unpleasant symptoms. This has likewise been advocated in the treatment of urinary infections with sulfanilamide, because some observers[3, 4] believe that the drug is more effective in an alkaline medium.

In the event that a patient is comatose or otherwise too ill to take the drug by mouth or if there is reason to doubt the efficiency of gastro-intestinal absorption (vomiting, fistula, diarrhea, etc.), sulfanilamide may be given parenterally.

Crystalline sulfanilamide may be prepared for parenteral administration in the following manner. The calculated daily dose (the same as by the oral route) should be weighed out. A sterile physiologic sodium chloride (0.9 per cent) solution should be brought to a boil, then removed from the flame. After boiling ceases, the sulfanilamide is added and the flask stoppered with the usual aseptic technic. The volume of saline used should be at least 125 cc. per gram of sulfanilamide (more if it is desired to give the patient fluids parenterally). As soon as the saline-sulfanilamide solution has cooled to body temperature, it can be administered subcutaneously (or intrathecally, if indicated). This solution is divided into equal parts and should be given at twelve-hour intervals. This procedure is carried out each day as long as parenteral administration is necessary.

Blood concentrations of sulfanilamide should be determined at two to three day intervals to make sure that the dosage is resulting in effective blood concentration. Because of individual differences in absorption and excretion, the above-mentioned dosages may be either too large or too small. The technic of determining blood sulfanilamide concentrations was devised by Marshall.[2, 5] It is a colorimetric test, which is based on the conversion of sulfanilamide to an azo dye and comparison of the unknown with a standard solution of known sulfanilamide concentration. The method is so simple that any well-equipped chemical laboratory should be able to perfect its technic without difficulty.

PRECAUTIONS AND DANGERS

Sulfanilamide can be administered to any previously healthy person with a minimal degree of risk. There are several conditions which demand more than ordinary care in the use of the drug, although they do not constitute definite contraindications. These are: kidney insufficiency, severe liver disease, blood disease and known previous drug sensitivity.

In the presence of impaired renal function, sulfanilamide is excreted more slowly, and consequently the drug tends to accumulate in the blood stream. This is especially true in the presence of nitrogen retention. In addition, there is evidence that sulfanilamide will aggravate preexisting kidney lesions. Consequently, it is necessary to give smaller doses in the presence of nephritis, to follow the blood concentrations more closely and to check the urine daily for signs of kidney irritation. In treating patients with abnormal kidneys, the indications for the use of sulfanilamide should be very carefully weighed against its possible harmful effects.

With known liver disease, sulfanilamide should be used with caution. The drug is reported to cause hepatitis[6] with jaundice and even acute yellow atrophy in patients with no known liver damage. Since sulfanilamide is acetylated in the liver, the addition of an extra burden on a previously damaged organ seems inadvisable.

Sulfanilamide at times exerts damaging effects on various elements of the blood. Most frequently, this is manifested by the development of cyanosis. The cyanosis, which occurs in approximately 50 per cent of patients, varies in degree from that barely noticeable to an alarming slate blueness of lips, nail beds and skin. It is generally conceded that cyanosis does not constitute an indication for withdrawal of the drug. The etiology of the cyanosis is not entirely clear. Both methemoglobin and sulfhemoglobin[7, 8] have been demonstrated in the blood following administration of sulfanilamide. However, the amount of changed hemoglobin found has often been insufficient to explain the degree of clinical cyanosis observed. Cyanosis without decreased oxygen capacity of the blood has been reported,[9, 10] thus excluding the above blood pigments. Of the two pigments,

methemoglobin is found more frequently, and occasionally sufficient amounts are present to cause air hunger. This cyanosis usually appears during the first forty-eight hours of administration and disappears in two or three days after the drug is withdrawn. The cyanosis at times serves to confuse clinical observations.

In the presence of pneumonia, methemoglobinemia will obscure cyanosis due to the pulmonary infiltration, and air hunger will be more apt to develop because both conditions decrease the efficiency of oxygenation of the blood.

Administration of oxygen will not relieve the cyanosis of methemoglobin or sulfhemoglobin; hence, its use is not indicated. If general anesthetics are administered in the presence of methemoglobinemia, the preexisting cyanosis is apt to be confusing to the anesthetist. Wendell and Hartmann[11, 12] have developed a method for complete but temporary relief of methemoglobinemia during administration of sulfanilamide. They found that administration of methylene blue caused a rapid subsidence of the cyanosis for a period of about eight hours. This drug may be given intravenously in 1 per cent solution in the dose of 1 mg./kg. or by mouth in 2 or 3 grain tablets. Methylene blue can be repeatedly administered to relieve cyanosis or it may be given prophylactically. These observers present data indicating that the presence of methemoglobin is a satisfactory explanation for the cyanosis observed, since a direct correlation between methemoglobin concentration and decreased oxygen capacity was found. It should be emphasized that cyanosis is not an indication for withdrawal of sulfanilamide, and methemoglobin concentrations large enough to cause dyspnea are rare.

Sulfhemoglobin formation occasionally follows the administration of sulfanilamide. This complication has been observed more frequently by English observers; namely, Discombe[8] and Paton and Eaton.[7] There is some evidence that administration of sulfates along with sulfanilamide tends to formation of this pigment. In view of this fact, it is inadvisable to administer sulfates either locally or internally along with sulfanilamide. It is probably true that disturbed intestinal function with excessive formation of hydrogen sulfide likewise tends to its formation. Cyanosis due to the presence of this pigment lasts for weeks after the drug is withdrawn, and it is not relieved by the employment of methylene blue. Because of its persistence, sulfhemoglobinemia constitutes a more serious complication than methemoglobinemia.

The red blood cells themselves are rather frequently affected by sulfanilamide. Hemolytic anemia occurs in two fairly distinct forms; namely, acute and subacute. The acute anemia[13, 14, 15] is fortunately seen only occasionally. It represents an acute hemolytic process accompanied by a rapid fall in red blood count and hemoglobin, together with jaundice, fever, occasional hemoglobinuria and anuria. This reaction appears in the first week of therapy. Response to withdrawal of the drug and transfusions has been satisfactory in every case thus far reported. The low-grade anemia is characterized by a more gradual decline in red blood count and hemoglobin. This anemia is only apparent after two or three weeks of sulfanilamide therapy. Deposits of hemosiderin in the spleen and prophyrinuria[16] suggest that it is likewise a hemolytic process. This form of anemia responds very satisfactorily to iron therapy when the drug is withdrawn.

A number of cases of severe neutropenia have been reported following administration of sulfanilamide.[17, 18, 19] In all probability, this reaction is attributable to the benzene ring. In the majority of instances, this complication develops in the second week of therapy. There is evidence that neutrophils are depressed in normal persons taking sul-

fanilamide during the second and third weeks. Of all the toxic effects on the blood-forming organs, agranulocytosis has proved to be the most serious, six deaths having been reported.

Since hemoglobin can be changed to forms not available for oxygen carrying, and since red blood cells and white blood cells can be seriously reduced in number, one should give sulfanilamide with caution in the presence of preexisting abnormalities of the blood. In the presence of anemia, the development of methemoglobin or sulfhemoglobin may produce serious air hunger. Anemia may be aggravated if red cells are destroyed by the drug. Likewise, the presence of leukopenia or especially neutropenia would seem to constitute a rather definite contraindication to the use of sulfanilamide. The blood picture should be kept in mind in every case treated with this drug or related compounds.

There seems to be evidence that the more severe reactions to sulfanilamide are due to individual hypersensitivity rather than any direct toxic effect. In addition, a patient who developed a reaction to sulfanilamide is liable to develop similar symptoms if the drug therapy is resumed. Consequently, any patient with a history of allergy, especially related to sensitivity to drugs, should be treated with more than ordinary caution.

There are numerous unfavorable side reactions of less severity and greater frequency than those mentioned above which contribute to the patient's discomfort. These are mainly drowsiness, dizziness, diplopia, headache, tinnitus, anorexia, nausea, vomiting and diarrhea. Fever with or without an accompanying morbilliform rash[20] has been described as a reaction due to sulfanilamide therapy. This type of febrile reaction commonly occurs after from seven to ten days of therapy and usually lasts two or three days if the drug is withdrawn. The reaction is more protracted if therapy is continued. The severity of this reaction varies considerably. Fever may rise to 40°C. (104°F.) and the rash may be generalized and, at times, purpuric or urticarial in character. At times, the fever without a rash occurs earlier and may even merge with the fever of the disease, thus creating a difficult diagnostic problem. Clinical observations have not revealed evidence of permanent damage of any sort occurring as a result of febrile reactions.

Recently, peripheral neuritis[21] has been reported as a complication of sulfanilamide therapy. This complication rather frequently follows the use of certain related compounds.[22] In the single case report of this condition following sulfanilamide therapy, two other possible etiologic factors were also present; namely, gonorrheal infection and fever therapy. If further cases of peripheral neuritis are reported, this condition must be considered among the more serious reactions due to sulfanilamide.

Southworth[23] reported a small series of cases with "acidosis" following administration of sulfanilamide. The carbon dioxide combining power of the blood falls 10 to 20 per cent by volume in each case. Hartmann and his associates[24] observed that the pH of urine and blood rose during the period that the carbon dioxide combining power fell. These workers state that a carbon dioxide deficit type of alkalosis was actually present. The confusion arose over the occurrence of hyperventilation, which Southworth attributed to "acidosis" (fall in carbon dioxide), and Hartmann to direct respiratory stimulation by the drug itself. From the practical standpoint, this reaction is unimportant, since it seldom occurs with the dosages outlined above.

INDICATIONS

Generally speaking, indications for the use of sulfanilamide are both clinical and bacteriologic. In the presence of a severe infection which clinically falls

into a group favorably affected by sulfanilamide, treatment should be started before bacteriologic data are available. Prompt bacteriologic confirmation of clinical impressions should be obtained in every instance.

The beta-hemolytic streptococcic infections are most favorably affected uniformly by sulfanilamide. This is true in direct proportion to the severity of the infection. Septicemia meningitis and puerperal sepsis should be treated vigorously. Such severe infections often demand parenteral therapy, especially in meningitis when supplementary intrathecal administration can be performed after drainage of spinal fluid. Erysipelas and cellulitis can be aborted in less than twenty-four hours if sulfanilamide is given in the dosage outlined above. The incidence of infectious complications following adequate sulfanilamide therapy is probably materially decreased. Beta-hemolytic streptococcic pneumonia and lung abscesses are favorably affected in most instances.

Relatively large series of cases of scarlet fever show no appreciable beneficial effect on the rash or other toxic manifestations of the disease. However, sulfanilamide does seem to decrease the percentage of purulent complications. Sinusitis, mastoiditis and otitis media seem to improve more rapidly with the drug, but, in these cases, evaluation of results is somewhat more difficult. In spite of the probable rôle of the hemolytic streptococcus in rheumatic fever[25, 26] and rheumatoid arthritis,[27] these conditions have not responded favorably to sulfanilamide therapy.

Urinary tract infections, notably those due to *B. coli* and *B. proteus*,[28, 29, 30] respond to sulfanilamide therapy in the majority of instances. *Streptococcus faecalis* is the only common organism infecting the urinary tract which is not susceptible to the action of sulfanilamide. In general, urinary infections can be treated with somewhat smaller doses of the drug, because tubular absorption results in an increased concentration in the urine as compared to the blood. Full therapeutic doses should be employed, however, if response to smaller dosage is not satisfactory. Sulfanilamide has the additional advantage of being active in an akaline urine; in fact, it has been recommended that alkalis be given along with the drug in the treatment of urinary infections.

Gonorrheal infections[31, 32, 33] are modified favorably by the use of sulfanilamide. Symptoms subside in three or four days in about 80 per cent of cases. However, complete sterilization is not effected for a considerably longer period. In cases of gonococcal arthritis, sulfanilamide is useful, but resistant cases require the use of artificial fever therapy, either subsequently to or in combination with sulfanilamide therapy.

Meningococcal meningitis[34, 35] and septicemia respond to adequate dosage in a very dramatic fashion. In treating meningeal infection, it is probably advisable to give the drug intrathecally at the time of spinal drainage as a supplement to oral or subcutaneous administration. This procedure is not universally accepted, however. In severe cases, the use of serum combined with sulfanilamide is both justified and advisable.

Recent reports indicate that sulfanilamide is a valuable aid in the treatment of acute undulant fever.[36, 37, 38] Sufficient evidence is not available at present to speak dogmatically on this point.

The effects of sulfanilamide on the pneumococcus have been studied extensively experimentally, but less so clinically. In general, it can be stated that the pneumococcus is affected similarly but less dramatically than the streptococcus. Experimental animals live longer if treated with the drug, as compared to control animals.[39, 40] There is a definite variation in susceptibility of different strains of the pneumococcus. Clinical

studies indicate that the drug is of value in pneumococcal pneumonia[41] and also in meningitis. Recently, a new derivative of sulfanilamide has been described which may prove more efficient in the treatment of pneumococcus infections. This chemical is sulfapyridine, which is essentially sulfanilamide linked to a pyridine ring. Collected results of all investigators[42, 45] indicate that the mortality for pneumococcus lobar pneumonia has been reduced from 20 per cent to 5 per cent. The high incidence of nausea and vomiting constitutes a definite drawback to the use of this derivative, however, as does the occasional occurrence of hematuria. With these exceptions, the drug acts similarly to sulfanilamide.

Other infections reported to be benefited by sulfanilamide therapy are chancroid,[46] malaria,[47, 48] bacilluria due to *B. typhosus*[49, 50] and staphylococcal infections.[51, 52, 53] Several virus diseases are said to be modified favorably by the use of sulfanilamide; namely, lymphocytic choriomeningitis,[54] trachoma,[55] lymphogranuloma inguinale[56] and canine distemper.[57, 58] True evaluation of chemotherapy in the foregoing infections is difficult and further data must be accumulated.

As regards dental infections, the clinical and bacteriologic indications for sulfanilamide therapy are similar to those discussed above. Bacteriologically, dental infections would seem less likely to be favorably modified because of the types of organisms involved. Hemolytic streptococci or pneumococci are the exception as causative organisms, while green streptococci and various anaerobes are more frequently encountered. Since manipulation of infected teeth often causes a transient bacteriemia, it might be worth while administering these chemicals prophylactically in patients with valvular heart disease. It is indeed probable that bacterial endocarditis could thereby be prevented in a considerable percentage of cases.

Discussions of sulfanilamide therapy are necessarily somewhat inconclusive as the whole problem is still in its embryonic stage. What one accepts as fact today might be disproved tomorrow. Since significant clinical and experimental observations appear each week in current medical literature, the drug should be used both cautiously and critically.

Within the next few years, it is probable that more efficient and less harmful chemotherapeutic agents may be discovered. Already, a variety of chemicals are being studied, but to date none have proved to be superior to sulfanilamide. The pyridine derivative of sulfanilamide seems to be the most promising, especially in the treatment of pneumococcus infections.

The opportunity to evaluate results obtained with sulfanilamide and related compounds affords every practitioner an unusual opportunity. To observe and participate in advancements in the chemotherapy of infectious processes is indeed a thrilling experience.

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RESEARCH IN DENTISTRY; ITS IMPORTANCE IN DENTAL EDUCATION

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IT is but one hundred years since dentistry was established as a profession. The founding, almost simultaneously, of dentistry's first school, first society and first periodical signalized a desire for knowledge and for progress. Comparison of dentistry's bounding advancement since 1839 with its halting development in countless preceding centuries reveals a record that is probably without precedent in any other art or science.

Sporadic contributions had been made to dental science by Paré, Fauchard, John Hunter and a few other brilliant persons, but it was not until after the birth of the first dental school that dentistry began its metamorphosis into an applied science. It was as though a dormant chrysalis had ended its months of inactivity and now, in a few minutes, was to develop into its adult form. This rapid change from a craft to an applied science was no more accidental than the transformation of the chrysalis. It was the result of the gradual development of the scientific approach, of the advent of dental research if you prefer. Dentistry's phenomenally rapid attainment of scientific stature was possible only through the cooperation of the twin handmaidens of science, education and research.

Naturally, as dentistry was born during an era of physics and chemistry, the first investigations were directed toward the perfection of materials and technics. This was probably a fortunate circumstance in the evolution of dental science; for, often, such research is not so expensive and is more immediately productive of practicable results than most other biologic investigations. In many instances blindly, but occasionally utilizing the methods of science, teachers in dental schools and capable practitioners developed filling alloys and cements, base-plate materials, methods of cavity preparation, surgical technics, prosthetic methods and orthodontic procedures. As the schools developed and expanded, the burden of investigation and evaluation fell increasingly on faculty members. Discoveries in the associated fields of anatomy, bacteriology, pathology, chemistry and physics were accompanied by new investigations in dentistry. It would be impossible to enumerate the many advances made by dentistry during the past few decades. With new discoveries, new medical sciences and new methods, the entire program of dental education was changed. It is a cycle wherein each new result leads to fresh advances and again to more advanced research. This process is quite the opposite of the "vicious cycle" of pathology and might well be termed the "progressive spiral" of scientific education. To discuss further the contributions of research to dental education is unnecessary, for no man can deny the simple fact that, without scientific investigation in the clinic and laboratory, dental education would now be at the exact spot where it stood before the first inquisitive mind instituted den-

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tal research. Dentistry and dental education cannot progress, cannot exist, without scientific research.

The research possibilities of dentistry have never been fully developed. We cannot deny the statement of the Rockefeller Foundation in its review for 1938[1] that "although America leads the world in dentistry, it is a leadership based more upon ingenuity of a mechanical sort than upon the amount or character of research done on the anatomy, pathology or physiology of the oral cavity." I do challenge the statement which follows this in that review: "Almost no dentists are trained in such a way that they can do research of a quality comparable to the research in medical schools on medical and surgical problems." The contributions of Horace Wells, G. V. Black, W. D. Miller, J. Leon Williams, C. Edmund Kells, E. C. Kirk, Chalmers J. Lyons, Theodore B. Beust and Rudolf Kronfeld, to enumerate only a few, are comparable, both in quality of research and as an application of science, with medical and surgical contributions of the same period.

During the last two days, we have been privileged to listen to reports on scientific investigations in dental science.* Papers of such quality would be accorded a place on the program of any scientific body. Many of us publish our results in the specialty journals of medical science. These papers appear side by side with contributions of our medical colleagues, placed there by editors who realize that dentistry is in actuality a medical specialty. It should be recognized that today, in our dental schools, there are dentists, with and without other academic degrees, who are as capable of scientific research as the most capable of their medical brethren. Why must we then confess that our leadership is based on ingenuity of a mechanical sort? Why have past accomplishments of dentistry not been more generously recognized?

It is true that dental science first developed the study of materials and technics. To merely disqualify the advances in these fields as mechanical would be absurd. Somehow, the impression has grown in the minds of the public, of the universities and even of the scientists themselves that the scientific quality of medicine and dentistry is somehow dependent on the laboratory. As Abraham Flexner has pointed out, this is not true: "Science is essentially a matter of observation, inference, verification, generalization. The mind of Sydenham, interested in a sick child and humanely preoccupied with its cure, did not, so far as it functioned scientifically, operate differently from that of Galileo, interested in cosmic physics."[2] Similarly, the mind of Black did not function differently scientifically from that of Koch.

The ingenious developments of operative dentistry are based on accurate laboratory studies in anatomy, physiology, chemistry, pathology, bacteriology and physics. The application of the springs, bars and bands of orthodontics calls on anatomy, physiology and endocrinology, as well as on mechanics. Scientific research can be applied equally to measuring the velocity of neutrons or to computing the strain on a pulley cable; to weighing antibodies or to selecting a pulp protector. While emphasizing the application of science to improve clinical methods of repair and control, dental education has continued in the progressive spiral. It must be admitted that the quantity of research was not great. The problems often were not particularly involved or particularly expensive. In many instances, the only requirements were a certain amount of basic training and the application of scientific

*The Eighteenth General Meeting of the International Association for Dental Research preceded and was coordinated with the meeting of the American Association of Dental Schools.

methods by an inquisitive mind. Fortunately for dental education, men with vision and scientific curiosity can often be attracted to universities for meager salaries and by promises of opportunities. Scientific investigations in dentistry are now at that stage where more than ability may be requisite. Dental education and dental research are becoming increasingly more complex and costly. We have recognized a fundamental similarity of tissues and functions in man and certain animals, and we have learned that we can produce diseases experimentally in those animals.

Since the emphasis in dental science is rapidly swinging from repair to prevention, we find it necessary to produce dental diseases in susceptible and comparable animals in an effort to ascertain causes and methods of prevention in man. Clinically, investigative endeavors are directed toward establishment of baseline norms. These experimental and statistical studies are expensive and, so far as practicable results are concerned, hazardous. Are they worth the expense?

We may profitably consider the example of the broader field of general medicine, which has been particularly fortunate in attracting gifts for scientific investigation. In many instances, years of work and huge expenditures of money have brought few material results, but have contributed something more intimately concerned with the progress of medicine than practicable discoveries. Research in medicine, as in all fields of science, has produced teachers with curiosity and a will to know. These attributes have been passed on from teacher to student so that today graduates of the better medical schools are not mechanics who specialize on the human body: they are scientists working in a phase of applied biology. The years of research of George H. Whipple led to the application of a liver factor in the treatment of anemia and to a Nobel prize. Probably a far greater contribution of his research is the scientific attitude his many students apply daily in their practices or pass on to another generation of students.

Lewis H. Weed[3] has said:

> Those of us who for years have contemplated medical education from the administrative standpoint are aware of one of the great dangers of medical education—that is, the danger of training superb technical machines competent to practice good medicine but lacking in intellectual curiosity, in the broad culture of the humanities. Our instructional processes, if they are to be sound, must be aimed at arousing an irresistible intellectual curiosity regarding structure and function as affected by disease.

Not only do students of general medicine or of dentistry, trained by capable scientists, think according to the methods of science, but they also apply scientific methods in treatment of their patients. This educational phase of scientific training must not be minimized in the future development of dental education. Dentistry is producing a few scientist-teachers so necessary for this scientific future; wofully few for her needs, but amazingly many for her opportunities. Give dentistry an opportunity paralleling that of other university disciplines and she will rapidly develop men to lead the world in a dentistry based on scientific achievement as well as mechanical ingenuity. The past record of dentistry warrants this assertion.

Not many years ago, a dental diagnosis consisted of locating carious teeth and periodontal pockets. This was accomplished with the aid of a mouth mirror and an explorer. Today, the scientifically trained dentist records a carefully taken history of his patient. He uses roentgenograms in locating incipient caries, early alveolar destruction and symptoms of inflammation. The electric pulp tester, incubator and microscope are often utilized. In certain cases, blood counts, serologic tests, chemical examinations or

biopsy studies are necessary. Drugs unheard of by the dentist of 1840, or even 1930, are being applied daily. All this is the result of research. The clinician and laboratory worker have been brought closer together. More intelligent methods of diagnosis and treatment have replaced guesswork and empiricism. We have been able to replace some of our purely reparative procedures with protective measures.

Dentistry has been led out of the *cul-de-sac* of technical overemphasis. Ahead, we can see a goal of real prevention. It is true that we have but recently realized the dangers of the blind alley into which dentistry had stumbled. However, the past has seen the evolution of dental education from a short course of one or two years in 1840 to its present six-year plan. Research has directed this development and, in turn, has been developed by it. The dental curriculum has been adjusted and readjusted in an effort to afford better training for dentists. Far more important than regimentation of the curriculum is the development and support of able men, scientists, in the dental clinics and in the dental sciences. We should have more dental practitioners who know how to diagnose and treat scientifically. Such a program requires, not more courses, but more inspired teachers, with a background in the methods of science. I do not mean to infer that all dental teachers must be research workers, but, rather, to state that no dental school can ever be a great school unless it has several able men in its laboratory and clinical sciences.

Dental schools, on pitifully restricted budgets, have developed the nucleus for this broader scientific concept. The administrators of some schools, on incomes that would scarcely support a single outstanding department of a medical school, are attempting to advance their entire institutions on a scientific basis. This is highly commendable, but nonethe-less shameful. As evidence of the desire for the newer dentistry, at least in certain schools, eleven of the dentists trained on Rockefeller and Carnegie fellowships at Rochester during the past decade now hold teaching posts in five American dental schools.

Last year, the Carnegie Corporation granted $53,500 for further training of young dentists in the methods of science. This is most gratifying and highly desirable, but we must ask what is to become of these men. Unfortunately, the schools lack the money to avail themselves of such well-trained teachers. If they should be called to dental faculties, it would be impossible, in most institutions, to supply them with the necessities for scientific study. If they accept teaching posts in the clinical branches, they will not be afforded sufficient time for research. One suggested answer has been faculty reorganization, but if it is necessary to let out two part-time men for one full-time teacher, the salary may be two honoraria, and duties so time-consuming as to crush enthusiasm.

Dentistry has able men and promising problems. The chief need of the schools is a financial one. Whether the present lack of funds is the fault of dental educators, universities, organized dentistry or any other group is unimportant. The cause should be intelligently presented to the large endowing foundations, who hold a public trust, to the dental profession, which has a sympathetic interest, to the universities, which must aid in the evolutionary process and to the public, who will be the ultimate benefactors.

In the course of this discussion, I have wandered afield, but, I believe, have stayed within the spirit of my subject. An effort has been made to show that dental education and research have developed together in a "progressive spiral" and that education and research in dentistry are inseparable; that dentistry's scientific contributions are of a high quality; that research by teachers is conducive to better teaching and, ultimately, more

scientific practice; that dentistry's primary need is money for education and research, and, finally, that programs should be instituted to advise the universities regarding the needs of dental schools and to attract endowments for education and research.

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DEEP INFECTIONS OF THE HEAD AND NECK

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DEEP infections of the head and neck are by no means a new group of diseases to the practitioners of medicine and dentistry; and they seem to be increasing in frequency, which is something we should expect when we stop to think of the many conditions that tend to lower the resistance of the human race against the infections prevalent today.

It has been only within the last few years that scientists have come to recognize the mechanism by which abscesses develop in the deeper structures of the head and neck. We have been taught that infections in this region of the body drain from their sources by way of the lymphatic system through the many lymph glands, and it was thought that as these lymphatic structures, primarily the glands, became overwhelmed with active bacteria, they broke down into abscess formation.

Undoubtedly, this theory was based upon a study of tuberculosis and a thorough understanding of the disease known as scrofula, in which that very thing happens. A peritonsillar abscess, quinsy, is another similar condition, due to a mixed infection, but these two conditions are primarily diseases of the lymphoid tissues, and the only relation that they hold to the infections to be discussed lies in the fact that these must be considered in the differential diagnosis.

Recent observations have shown that, with the exception of the diseases of the lymphatic system, all infections of the head and neck tend to drain or extend along the tissue planes until Nature forms a wall around them and an abscess is localized. Such infections may be of local or constitutional origin, and the most common points of the local beginning are infected teeth, the infection extending through the ducts of salivary glands and perhaps induced during a surgical procedure.

When they are of metastatic or constitutional origin, the bacteria may be carried into the area from any portion of the body by the blood stream. Such conditions are rare, but they do occur.

The subject of focal infection, although it has been worn threadbare by discussion, is by no means a settled question today; but, regardless of our ideas concerning it, there is no doubt that bacteria do, through the protective processes of the human body, become localized in focal areas, where they remain alive though quiescent, ready to become activated into a virulent force whenever the

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resistance of the patient is lowered or the area is traumatized. As long as bacteria are forced to live in their accustomed habitat, they will usually behave very well, but the minute that they come in contact with injured tissue cells or tissue juices in a patient with a lowered resistance, they become constitutional enemy No. 1, and occasionally a patient's life is in the balance before they can be reckoned with.

For example, imagine an infected pocket under the gum tissue which covers the distal half of an erupting lower third molar and so swollen that the gum is injured as the patient bites; or consider the same area with a subacute infection present and think what would happen if some ambitious surgeon were to infiltrate the tissues with a local anesthetic and perform an extensive gum trimming operation. The removal of any tooth with an acute or chronic infection is always a potentially dangerous procedure, because the innocent-appearing bacteria in those areas may become so activated that all of the reserve force of the patient is required to localize and destroy them, and not infrequently cellulitis and abscess become complicating factors of a most serious nature. The patient's recovery is entirely dependent on his ability to successfully combat the infection.

The most common deep abscesses of the head are those which occur in the pterygoid triangle, or mandibular fossa. It is bounded above by the pterygoideus externus, below by the pterygoideus internus, with the ramus of the mandible forming the external surface and the pterygomandibular raphe, the superior constrictor of the pharynx and buccinator muscles making up the internal and anterior boundaries. It is into this area that the oral surgeon introduces the hypodermic needle in making a mandibular injection for block anesthesia.

Abscesses in this area, for some reason, are associated with infection around the molar teeth, upper and lower. They may follow the removal of infected teeth or be associated with infected opercula over erupting or impacted third molars.

The symptoms are soreness of the throat, followed by swelling of the tissues in this area and a gradually increasing trismus, together with difficulty in swallowing. For the first few days, the temperature reaches 101 to 103° F., the pulse becomes accelerated and there is a slight increase in the respiration rate. As the patient experiences increasing discomfort when swallowing, there is a tendency to decrease the amount of fluids taken and the patient becomes dehydrated and toxic. Occasionally, there is evidence of a streptococcus invasion, and there is a temperature rise to 105 or 106°, together with an increase in the pulse rate to 130 or 140 and the respiration rate to from 28 to 32. The white blood count rises to from 16,000 to 20,000 per cubic millimeter, of which about 85 per cent will be polymorphonuclear leukocytes. On about the eighth day, there will be evidence of a localization of the abscess. Aspiration will usually demonstrate pus, and surgical drainage is indicated. More frequently, the abscess localizes in the posterior part of the swelling and ruptures spontaneously. This condition simulates a peritonsillar abscess, but does not localize on the oral surface of the soft palate as do the infections of the tonsils. Recovery is usually prompt and without complications.

When there is involvement of the upper portion of the triangle as a complication of infection of the upper molars, the abscess takes longer to localize, and the planes through which the infection diffuses are more extensive.

First, there is swelling around the posterior tuberosity, and even though the field may be opened and the pus drained, there is a tendency for the infection to extend upward under the temporal fascia and temporal muscle to the skull, medially through the tissues of the soft

palate, and then downward into the lower portion of the triangle, where another abscess will localize as has the one first considered. The general findings are the same: a gradual rise in temperature and in pulse and respiration rates, with an increase in the white blood count, particularly of the polymorphonuclear leukocytes. Not infrequently, surgical drainage will have to be carried out four, five or even six times before these patients recover, and as many weeks may pass before the patients are out of danger.

The next most common site for deep infections is the lingual fissure along the side of the posterior portion of the tongue. These infections are usually complications of infections of the lower bicuspid and molars.

The first symptom is again soreness of the throat, followed by stiffness and soreness of the tongue. There may be some difficulty in swallowing, but it is not so marked as occurs with the abscesses already described. Trismus is a later symptom. There is a gradual rise in temperature and pulse and respiration rates. The edema of the area is often so great as to lead one to suspect infection in the submaxillary triangle. The blood findings consist of the usual rise in number of the white cells as found with abscesses elsewhere in the body. The surgeon can generally palpate the area by inserting the little finger between the teeth. When all of the findings indicate that localization has taken place, the swelling should be aspirated, and when pus can be demonstrated, surgical drainage should be instituted.

Infection in the submaxillary gland or triangle is not, as a rule, so difficult to manage. It rarely interferes with swallowing and breathing, because it is more superficial and more readily accessible when the time comes to open and drain the area. These infections most frequently arise from infected teeth, a retrograde infection through the duct of the gland or stones in the duct or gland.

The patient will first complain of a slight swelling and soreness under the mandible in the region of the submaxillary triangle. There is a gradual increase of the pain and swelling, with a definite stiffness of the muscles, but no particular trismus. The temperature will rise, but not extremely high. The pulse and respiratory rates will increase, but the picture of toxemia is rarely seen.

These areas may be opened at the proper time by extra-oral incision. Although this type of abscess is in the upper portion of the neck and either in or around the submaxillary gland, it is located in one of the outer planes, being immediately under the platysma muscle.

Occasionally, surgeons observe cases in which infection of the submaxillary triangle occurs secondarily to an abscess formation in the lower portion of the pterygoid triangle. For this reason, it is thought that these two areas are connected by a tract passing between the stylohyoid and the posterior belly of the digastric muscles. There are times when infections localize in abscess formation in the region of these two muscles. This location is one of the deeper planes. These conditions are usually associated with infections around the lower molars.

The symptoms are that of swelling and soreness immediately posterior to the angle of the mandible. There is stiffness, but no trismus, and rarely difficulty in swallowing. Some patients complain of soreness of the throat, but not of a severe degree. The swelling increases in size at the expense of the outer structures and the discomfort may become very marked. When there is evidence that the abscess is localized, it is well to aspirate, and, if pus can be demonstrated, the abscess is opened and drained, but it is well to remember that this field is directly over the carotid arteries and jugular veins.

Abscesses extending down the side of the neck may arise from an infection higher up, of tuberculous character, or

infection of a branchial cyst. They are usually in the outer plane and immediately below the platysma muscle. When they are localized, a differential diagnosis should be made and the areas of mixed infections should be drained.

Another field where infections may be very serious is the upper portion of the neck and the floor of the mouth. Abscesses in the sublingual area are the result of a retrograde infection through the ducts of the glands, from infected teeth or from infected areas of the mandible. They may localize in the outer plane under the platysma or in the sublingual area posterior to the geniohyoid muscles. Infections in this area are frequently associated with extensive edema, which often spreads downward as far as the clavicles. Superficial abscesses rarely show extreme symptoms, but those localized in the deeper planes may assume serious aspects.

When the infection is located posteriorly to the geniohyoid muscles, the patient complains of swelling under the tongue and pain under the chin. The temperature, pulse, respiration and blood findings are in keeping with abscesses of moderate character. When pus can be demonstrated, drainage should be instituted, either intra-orally or from the outside, according to the point of fluctuation. If the extra-oral approach is attempted, it is usually wise to carry the hemostat through between the geniohyoid muscles in the midline to insure complete drainage.

Infections in the deeper fascia planes, such as those posterior to the hyoid muscles, are dangerous, assuming the aspect of a true Ludwig's angina. At this depth, it is often difficult to determine the points at which the abscesses localize until they become large and dangerous. The edema may be extensive and the complications are many. The temperature and pulse and respiration rates are high and the blood pictures are often of extreme seriousness. The patients suffer much pain on swallowing and may have difficulty in breathing. Extensive dissections are frequently made, not only to locate the abscesses, but also to reduce the edema, and tracheotomy may be necessary.

The treatment for all of these conditions is very similar. Obviously, there must be variations to meet the complications as they arise. When the infections start (as indicated by pain and swelling that cannot be accounted for), it is well to have a complete blood count including a differential count of the white blood cells. This will give a fair idea of the patient's resistance. Urinalysis will show the ability of the patient to eliminate fluids, as well as reveal any of several possible complicating diseases. Examination of the heart and lungs is also desirable.

The patient is put to bed, hot fomentations are applied continuously, and quantities of fluids such as sweetened fruit juices, carbonated waters and water, and ice cream and ices are given. The only contraindication as regards fluids is from a decompensated heart. It is well to prescribe oil in small amounts night and morning to insure complete evacuation of the bowels (liquid petrolatum one-half ounce or petrolagar one-half to 1 ounce). Sedatives or narcotics may be administered for pain. Acetyl salicylic acid is not used in these cases in our clinic at Grant Hospital because this drug lowers the temperature artificially and an accurate temperature chart is all important. It tells whether the patient is putting up a fight against the infection and it also indicates the type of infection—staphylococcus, mixed strains or streptococcus. It seems to be the impression of some men that the high temperature is a dangerous factor, but that is erroneous. It is the condition causing the temperature elevation that is to be feared, and there is no sense in masking the only indicator available.

As for hot moist dressings, it is not at all necessary to apply dressings hot

enough to blister the skin. There seems to be a feeling that heat must penetrate the tissues, but really heat will not penetrate more than 1 or 2 cm. unless the tissues are cooked. The heat stimulates the sympathetic nervous system, which produces the desired response in the deeper structures; that is, it causes, among other things, a dilatation of the blood vessels, thus increasing the flow of blood to the part. It also renders the blood vessels more permeable, so that the white blood cells, with all of the antibodies, may pass through the vessel walls to reach the field of battle with greater ease and in larger numbers.

Cold does not penetrate the tissues unless the tissues are frozen, but it causes a constriction of the blood vessels and reduces the blood flow to the part. We prefer hot moist dressings.

Fluids are vitally important to the patient. They furnish nourishment which is easily digested, supply the important vitamins and dilute the many poisons before washing them out through the kidneys. An old chief surgeon once said, "You cannot wash out a sewer system without water, can you? Well, how on earth can you expect to wash out a human system without water?"

If the patient is unable to swallow, a physiologic solution of sodium chloride with 6 per cent glucose may be given subcutaneously, intravenously or by rectum. One very satisfactory method of introducing fluids is administration of a narcotic (morphine sulfate grains one-eighth to one-fourth) and passing a small rubber gastric tube through the nose and down into the esophagus or stomach. Both fluids and medicaments may then be given without difficulty.

If the temperature is high and hectic, one may suspect a streptococcus infection, in which case sulfanilamide by mouth or hypodermic is indicated. Occasionally, it is advisable to give a blood transfusion, especially in cases of lowered resistance or when localization of the abscess is delayed. If the edema becomes too great, it may be necessary to open the tissues and place drains. When breathing becomes difficult because of edema of the glottis, a tracheotomy must be performed. Then we should be on the lookout for heart failure, pneumonia and gallbladder infections.

A general anesthetic should not be given when sulfanilamide has been used. No doubt, the improved preparations of the drug carry less risk, but many very stormy results have been reported from this combination.

Deep x-ray therapy has been used very successfully to promote localization of an abscess. The heat from the x-rays opens the intra-cellular spaces and renders the tissues more permeable, thus allowing the white blood cells and blood serum to reach the islands of bacteria. It is a great help in some cases.

Deep infections of the head and neck should always be considered very serious. Most of the patients will recover, but no surgeon today has a cure for all of them. All we can do is to assist Nature in localizing the infection and institute drainage as soon as pus can be demonstrated.

55 East Washington Street.

DENTISTRY MOVES ONWARD

By Leigh C. Fairbank,* D.D.S., Sc.D., Washington, D. C.

THE year 1940 marks dentistry's centennial as a profession. In one hundred years of dental education, our profession has advanced from an uncultivated, mechanical and haphazard calling, devoid of principles or methods, to its present stature, ministering to the dental needs of millions of people. There may be among us tonight some who have devoted fifty years to the practice of dentistry. What an occasion for them! What a flood of memories and what pride is theirs when they reflect upon the advances made during their years of service! In those of us who can look back over fewer years of practice, there is also a feeling of pride—pride in having shared in the accomplishments of the first century of dentistry. We are stimulated by the thought that as dentistry moves onward into its second century, perhaps we may contribute something of real value to our profession.

During the past one hundred years, many dental problems have been solved. Many of our great men in dentistry, by laborious and self-sacrificing work, established principles and methods for the profession they loved. Not only was the general practice of dentistry developed, but also several distinct specialties, all of which contribute to the health and happiness of mankind. Today, dentistry is recognized as an essential health service. For more than forty years, it has been among the health services in the Army. For more than twenty years, it has been a rapidly growing agency in public health service. The dentists of our nation are found among the cultured and distinguished citizens of every community. Dentistry's first century has been a productive one, and with confidence and zeal it moves ever onward toward eras of even greater progress in the future.

In my many trips to various states and cities, I usually travel by airplane. This is a habit of mine which dates from about fifteen years ago. One thus becomes air-minded, especially after overcoming a tendency to air-sickness! It is interesting to experience air travel. Observation of this old world of ours—the earth, the sea, the sky! One begins to think and feel like the pilot. To me, it is always fascinating. The modern airplane is an astounding product of science. Traveling through the skies at great speed with the utmost safety is really fantastic, and I have learned many interesting things from the accommodating pilots who have taken me all over the country. One thing, for instance, the horizon, is tremendously important to the pilot. There are many instruments on the modern airplane to assure safety, one of which, a delicate one, indicates the horizon. With plenty of altitude, it matters little what is below—hills, lakes or mountain ranges—the important thing is to fly toward the horizon. As the ship climbs, the hills, which a few moments ago hemmed us within a small area, disappear. The horizon, which was but a few miles away when we taxied down the field for the take-off, is now extended

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for a hundred miles. The old limiting horizon has disappeared. Now we have an unobstructed view of other airports, other cities and other hills! It is another world, another perspective of old barriers, and as we speed along, it is always toward another horizon—onward!

Flying has given me a new perspective of dentistry. During the hours spent in air travel, thoughts of new horizons, the dental centennial and the new century for dentistry have developed an interesting philosophy regarding our profession as it moves onward. It seems that this philosophy carries us over the dental problems of today. The new horizon discloses a vision of tomorrow. The altitude gives another perspective of the mountains—clear and sharp in the bright sunlight of cloudless skies. With these thoughts, it is my wish that you too look toward the new horizons with me as dentistry moves onward. Let us fly above the surrounding hills which are the obstacles today. Let us take as our ship the sciences, which are the very fundamentals of all health services, and observe with genuine purpose just how we must plan our course for dentistry's future as we go forward. Perhaps we may find that these sciences and this philosophy will reveal some significant facts and a new and more satisfying course for our profession as we move toward the new horizon.

The advances in dentistry deserve a place among the brilliant achievements which have brought health and comfort to mankind. Our profession has been blessed with fine leadership. Our leaders have been inspired with an ethical and altruistic concept for service and with self-sacrificing determination to build a profession. Dentistry's progress has involved development of the arts, in the mechanical and artistic requirements of restoring dental function. Restorative methods have given American dentistry its place of unquestioned leadership throughout the world.

In spite of all our achievements and our superior leadership, as we look into the problems of dental health today we must admit that in our progress methods for prevention have not been revealed. We can no more control or eliminate dental disease than we can empty the Houston Channel with a dipper! Our major efforts have been chiefly toward restoration or the elimination of disease processes. As we survey dental problems, we are convinced that our greatest concern should be the primary causes of dental diseases and maladjustments, their influence upon body health and the development of measures for prevention. Too long has dentistry been treating the effects of disease, and too little attention has been given to the elimination of the causes of disease.

We live in a marvelous world today. The death-dealing scourges of disease have largely come under control, owing to the amazing advances of medicine and the allied sciences. Prevention, control and elimination of disease have given new meaning to life for millions of people and opened the whole world to commerce. New life, new comforts and new wealth are ours today through preventive health measures. Dentistry belongs to the group of health agencies. Our endeavors must become effective beyond the restorative efforts which largely limit our service today. Not only primary disease, but also resulting infection which influences general health must have our serious consideration, if we are to be an effective health agency. No! Restorative measures, the pride of American dentistry, are not the sole solution to the health problems before dentistry today. We must search out a new horizon for the answer.

Dentistry has recognized these problems in the past—these hills which have held our horizon so close to us. The difficulty is that we have tried to scale the heights mechanically. There has been an honest effort by many to seek a sound solution, but our whole concept, educa-

tion and practice, in the past, have made it impossible to grasp the entire problem. There is a trend today toward the basic sciences which make up the very background of the health services. These considerations are fundamental, and it might be helpful to analyze this approach to the problems of dental health and plan for their solution.

There are many evidences that every oral disease or maladjustment has both local and systemic causes and effects. Caries, periodontoclasia and malocclusion are all local, but the effects are widely extended. It is probable that there is no systemic condition which is not reflected in the oral tissues. The orthodontist has apprehended several body dysfunctions bearing directly upon the conditions of malocclusion. It is evident that dental caries and periodontoclasia are the early signs of a disturbed function before organic change becomes apparent in other body tissues. If study and experiment disclose this, there will come a helpful vision of our problem. If a trend toward the basic sciences brings helpful measures for the solution, our course should be in that direction. If research brings to dentistry a recognition of the primary causes of dental disabilities, we should direct our efforts for prevention into the avenues wherein the solutions may be found. If advances in the basic sciences and newer knowledge concerning disease are encouraging today, these findings should be correlated and projected into our whole concept of clinical practice, if we are to meet the real needs for dentistry as a genuine health service. We must have the wisdom to use these agencies in the solution of our problems.

In these days, we have become accustomed to change. Whether it be in government, society, business, health or disease—even in life itself—change is the most constant element we meet. The growing body of knowledge brings change. It forces new concepts as new meaning is given to the processes of life, the influence of environment and the factors of disease. Our profession is sensible of this influence. It is rapidly recognizing remote factors and slowly accepting newer concepts revealed through contemporary developments in the scientific fields significant to general health. This is manifest through the same type of leaders who have always inspired dentistry toward greater accomplishments. The interesting fact is that this trend of today is largely initiated by brilliant men in clinical practice or in the laboratory, men who are motivated by the same desires and the same altruistic purposes which animated our leaders in the past. It appears that the efforts of an increasing number of men in practice are forcing this changing concept just as earnestly as are those in the field of dental education. Study in the field of orthodontics has revealed countless influences in various disturbed physiologic processes which alter growth and development of the dental structures. Specialists have toiled for years, seeking the causes of malocclusion. Their endeavors have revealed an intimate relation between dental conditions and general body functions. This work has brought to all of us a keener understanding and a genuine realization that the dental structures are living body tissues, maintained by adequate nutrition and influenced by the same physiologic processes which reflect the changes in balance and stability in health and disease. This is convincing proof that the great problems of dental caries and periodontoclasia should be studied as general health problems rather than local health disturbances.

The study of dental structures, the influence of disease and the process of repair discloses some interesting facts. Tooth structure differs from other body tissues in that it does not possess the inherent power of repair. A fractured bone, given reasonable care, will undergo repair of the break in its continuity.

Ligate a blood vessel and nature will establish a new collateral circulation. Section a nerve and regeneration will take place. Destroy a portion of a tooth and degeneration occurs. We must manifest a recognition of this in our approach to the problems of dental health. We must develop a real understanding of disease, its nature and its causes. We must recognize associated clinical signs. We must have exact knowledge of the resulting functional and morphologic changes. We must evaluate symptoms and clinical and laboratory findings. These are all essential factors in the consideration of manifestations of disease.

It is particularly necessary for us to consider dental lesions in the same way. The essential factors in the production of dental lesions are exactly the same as those which produce disease elsewhere in the body. Because of the nature, structure and environment of the teeth, diseases affecting them may be considered as signs and symptoms of disturbed function. If we determine to seek the cause of dental disease, we must inquire into the very nature of disease and search deeply into the phenomena of physiologic processes and the deviations which bring about tissue and organ disability. There is ample evidence that dental caries is a local manifestation of an unbalanced nutrition. The local exciting cause is acid production by bacteria in the mouth. Oral secretions reflect the nutritional balance and, under optimal conditions, control the bacterial flora in the mouth and render inert their metabolic products. Dental caries is primarily a disease of youth, associated with growth and development. Any condition which tends to lower the reserve of alkali or decrease the normal concentration of basic elements in the blood and tissue fluids creates an imbalance toward the acid side, decreases acid resistance to disease and increases the liability of the teeth to decay. When growth processes are completed, activities in body structures change. These cycles in life processes are amazing. It is evident that the nutritional balance maintained during the growth period to sustain physiologic stability is altered when growth processes are completed, and concentrations of basic elements in the blood and tissue fluids develop an imbalance toward the alkaline side, creating a tendency toward periodontoclasia. Balanced nutrition is exceedingly important in this metabolic process.

We have yet to bring into our structure of dental education even a working knowledge of these amazing processes of life so greatly affecting dental health. We have made only a small effort to correlate contemporary knowledge for dentistry and to make it useful in the clinical experience of our profession. We have not made a scientific approach to the problems of dental health as dental physicians, which must be our rôle if we are to meet the growing demands in the great field of prevention today.

The importance of all the basic sciences has greatly increased in the last twenty years. The growing body of knowledge is continually weaving a new fabric. It changes with the introduction of each new thread; it alters the design, and in this new pattern we see significant figures important to dentistry. Among these changes are the new concepts in the field of physiology and the complex surprises in biochemistry. There is an inseparable relation between these two sciences, and the advance in physiology is directly attributable to progress in biochemical knowledge. Biophysics today alters our whole idea as to physiologic processes. Colloidal chemistry, chemistry of the hormones, the growth of knowledge concerning nutrition and metabolism have all contributed to a variety of important conditions recognized as influencing the dental structures and the body as a whole. Unquestionably, every phase of clinical medicine and dentistry, and every branch of the medical sciences, is concerned with nutritional factors as

causes of disease or as participants in important disease mechanisms.

In histology, emphasis is laid on physiologic appearances and their relation to function in contradistinction to a fixed or so-called normal state. The reaction of tissues to various conditions must be distinguished so that we can recognize the variations in structure that fall within physiologic limits and the variations which are manifest in the realm of histopathology. All our progress in the treatment of disease and the understanding of pathologic processes is influenced by the study of diseased tissue. Linked with progress in this field is the need for a deeper understanding of bacteriology in dentistry. It is imperative that the profession be grounded in all these basic sciences if it is to meet the larger demands of a profession. We must develop new principles and new methods of practice in this newer clinical phase of preventive dentistry. The problems of dental health must be viewed as new dental projects reaching into the field of human biology. All the possibilities of dentistry as a great health service depend on this integration.

As we move onward and catch these glimpses of our problems, it becomes increasingly evident that our progress toward the new horizon lies in a closer development with medicine. I sometimes fear that in making this frequent statement I have been greatly misunderstood. I am not advocating an M.D. degree for the dentist, but I am maintaining the need for unity in medical and dental thought, training and experience, so far as it may in any manner concern these problems of dental health. This will bring us closer to medicine—closer to becoming a very part of medicine in some respects—but not in a sense that the physician of tomorrow will pose as a dentist or the dentist will pose as a physician. The dentist of tomorrow must have an understanding of diagnosis. We must assume with confidence our place in the field of surgery and must intelligently meet the demands for successful preventive dentistry. The medical profession is asking for our help; an intelligent and awakened public is demanding our aid. Dentistry must consider with care the related basic sciences and make them a major part of its fundamental structure. In our study, research and clinical experience, we must work with medicine, with a determined effort to solve these important problems of dental health now before us.

How are we to meet the needs of today and also build our structure to meet the requirements of tomorrow? These new specifications for dentistry call for decided changes. In the Army, in order to meet the needs of today, we have developed a policy of employing the very best restorative measures. The training of our dentists is easily directed toward the necessary concept of integration with medicine. We work as an interrelated and interdependent service, the purpose of which is to bring this transition only into those avenues which are definitely related to dental problems and their solution. Our policy provides that the mechanics of laboratory processes be carried out by technicians, under the supervision of highly trained dental officers. Our laboratory service has added tremendously to the quality of the whole dental service. Please understand me: The dental officer "dominates" the laboratory service. Our technicians do what they are told to do by our dentists, who know what we want. Our technicians are skilful laboratory men, but no technician in the Army is permitted to express an opinion as to professional service or how that service will be executed. This is not his function. I believe that the whole dental profession can benefit by this example. We are actually delegating to technicians, under the proper control, those essential duties and procedures which can be safely turned over to them. We do not believe in various professional "levels" nor do we recognize

a professional status for technicians. We put craftsmanship where it belongs. The dental officer represents the professional aspect of dental service. This procedure is similar to those accepted in clinical laboratories maintained by medicine.

The really constructive work for a new era for preventive dentistry will come from the research laboratories. The research projects of the Dental Corps are directed toward the solution of major dental problems. Efforts are directed into the fields of bacteriology, histopathology and biology. Our studies in immunity, hematology, biochemistry and nutrition are certain to have results which will be helpful in future efforts toward prevention. Through the agency of the Army Dental School, we project the results of research so that they become useful in clinical practice and in the preventive measures for control. Thus, dental education is spread over the basic structure which we believe is essential for more effective measures in the control and prevention of dental disabilities. My greatest dream for preventive dentistry is to set up a program at the United States Military Academy at West Point, based upon the results of an approved research. When we can maintain a program which will result in the elimination of dental caries in a class of cadets over a period of four years, our project will help the dental profession in the new era of prevention.

Again the airplane gives us another interesting parallel, that the new horizons for dentistry may come into view on the wings of science. All of us have watched groups of planes fly in formation. As they roar overhead to distant horizons, we see the sameness in their construction. They are powered by the same type of motor. Their design is identical. They are all on the same general course. One pilot controls each plane. Yet—watch! As they maintain their formation and carry out their mission, one plane directs every movement! Look! That turn so skilfully executed was the result of a signal from the leading ship. If they continue on their course and reach that far-off horizon, it must be done by coordinated effort and power, directed by one leading and guiding force. How similar is our big problem in dental health! As an essential health agency, dentistry must put into its structure all those elements which science has revealed to us, whereby we may gain altitude over our problems today and secure the power to fly on our course to the horizon of prevention. We must fly in formation with other health agencies. Fundamentally, we are similar, for we are fighting disease. If we would keep our place in this formation of health agencies and our efforts parallel with the efforts of medicine, our ships must be of the same sturdy construction and of similar design. In the formation flight toward prevention—on toward the new horizons of a new century and a new era—we must follow the signals coming from science. Medicine has a place in this formation: Dentistry has a "file" in this group. The mission of this health flight lies onward—beyond the horizons of today. It is toward the healthy, happy and contented land where science leads us—to an era of real prevention!

There is work for us in the new century. Restorative dentistry—the very best developments of the American School—will always be in demand. We must endeavor to meet the needs of today as best we can, but we must build for tomorrow.

May each of us share in a common determination as we give power and vision to our profession. The colorful skies of the new century may be seen on that new horizon from the higher altitudes. May the dawn of our new day find us embracing this new concept and setting our course in the right direction as dentistry moves onward.

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INTERNSHIP AS A PREREQUISITE FOR DENTAL LICENSURE

FOR two decades now, dental educational requirements have been steadily advanced at a rate that has aroused anxiety, if not criticism, in some quarters, lest academic and professional requirements for dental practice be advanced and increased too rapidly. Within this period, we have seen the educational standards advanced by leaps and bounds, from three years of professional education with a suppositional three years of high school preparation, to the four-year high school preparatory training and three years of professional education; then to four years of professional education and one year of academic preparation, and, later, to four years of professional education and two years of academic preparation; and now one year internship is being considered as a prerequisite to dental licensure.

The requirements have thus been advanced so rapidly that many have believed it difficult to make proper adjustment to the new standards and, too, the change in requirements reduced the number of men entering dentistry each year, a steady decrease having been shown since

While there have been numerous causes to which this decrease ...en attributed, the advancing educational requirements have, we believe, been a deciding factor. Of course, we realize that the period of depression has had a definite influence, and although, with improving conditions, more students are enrolling, we are still anxious lest the number fail to increase in proportion to the public need for mouth health.

To advance dental standards to an equality with those of medicine seems to be the goal. And now we have an example in which the goal has almost been reached! The State of Delaware has just passed a dental law in which one year of internship in a hospital is made a prerequisite of dental licensure. And, in another state, a law has been passed that requires licensure before internship. While these new advances may be somewhat confusing and are no doubt influenced in a measure by local conditions, they are signals of a definite trend in dental education and are indicative of the relation which dentistry of the future must bear to medicine.

Dentistry is this year celebrating its one-hundredth anniversary as an organized branch of health service developed on a separate and distinct basis from medicine. We have long since proved that dentistry is more than a mechanical art, that its cosmetic, esthetic and mechanical aspects demand a type of education and preparation established on an intensively selective basis and one which will relate these so-called mechanical aspects to the physiologic and biologic concept of dental health service.

Miller's work directed attention to the fact that dentistry, to be practical, must be scientific; that the so-called practical nature of the mechanical phase of dental service depended for its practicality on the scientific application of its principles to biologic and physiologic laws. It was the realization of the interdependence of these two approaches—the practical and the scientific, or the mechanical and the biologic—that was responsible for the determination to establish dentistry upon an autonomous basis; and the present-day educational objective is predicated on the definite interdependence of these two educational approaches.

The evolution of dental education coevally with medical education has demonstrated conclusively that while much of the knowledge of medicine is desirable and necessary in the education for and practice of dentistry from the standpoint of its biologic aspects, all of the knowledge of medicine is by no means necessary for the intelligent and efficient

practice of the dental branch of the healing art. We have, in the development of this biologic relationship, taken as much of medical education as we believe is necessary to attain our objective. The inclusion of the internship as part of the preparational dental course is but an extension of the concept of the intimate relation of some dental diseases to systemic conditions.

While we do not believe that we have yet reached the stage in our educational development where we should make internship a prerequisite to dental practice, we do believe that the time is not far distant when such a prerequisite will be desirable.

Medicine, itself, has been many years in arriving at the stage in its educational program where it has deemed it advisable to make internship service a prerequisite of medical licensure, and, even now, scarcely half the states of the Union make internship compulsory. There are, however, some twenty-two states which have concluded that compulsory internship is helpful and even necessary as an educational desideratum to medical practice, and, in the light of our present trend toward enlarging the scope of dentistry, it has become necessary to enlarge the scope of the education of the prospective dentist to include a knowledge of clinical medicine obtainable only through the agency of the internship. There is not the least doubt that knowledge and experience in the clinical phases of surgery as related to dentistry are most beneficial in the practice of dentistry in its broadest sense, and there is no doubt that it would require many years of private practice to acquire such experience and knowledge; hence, the desirability of internship in the preparation for the practice of dentistry as it is being conducted today.

There is another phase of the internship that can be of inestimable benefit to dentistry, and that is in developing in the associated medical interns and physicians an appreciation of the importance of dentistry as an aid in controlling and curing many systemic diseases, particularly those of dietetic origin. The dental intern can be very helpful toward the reconstruction and convalescence of the patient by the maintenance of a healthful portal of entry and a healthy and efficient masticatory apparatus for the dietetic requirements of convalescence. Such service can readily be the means of spreading the gospel of mouth hygiene as a factor in body health and of greatly enhancing the respect of both the patient and the medical man for dentistry and for dental health service.

The dental intern can, through the intelligent application of his knowledge of the relation of mouth disease to systemic conditions, do

1924. While there have been numerous causes to which this decrease has been attributed, the advancing educational requirements have, we believe, been a deciding factor. Of course, we realize that the period of depression has had a definite influence, and although, with improving conditions, more students are enrolling, we are still anxious lest the number fail to increase in proportion to the public need for mouth health.

To advance dental standards to an equality with those of medicine seems to be the goal. And now we have an example in which the goal has almost been reached! The State of Delaware has just passed a dental law in which one year of internship in a hospital is made a prerequisite of dental licensure. And, in another state, a law has been passed that requires licensure before internship. While these new advances may be somewhat confusing and are no doubt influenced in a measure by local conditions, they are signals of a definite trend in dental education and are indicative of the relation which dentistry of the future must bear to medicine.

Dentistry is this year celebrating its one-hundredth anniversary as an organized branch of health service developed on a separate and distinct basis from medicine. We have long since proved that dentistry is more than a mechanical art, that its cosmetic, esthetic and mechanical aspects demand a type of education and preparation established on an intensively selective basis and one which will relate these so-called mechanical aspects to the physiologic and biologic concept of dental health service.

Miller's work directed attention to the fact that dentistry, to be practical, must be scientific; that the so-called practical nature of the mechanical phase of dental service depended for its practicality on the scientific application of its principles to biologic and physiologic laws. It was the realization of the interdependence of these two approaches—the practical and the scientific, or the mechanical and the biologic—that was responsible for the determination to establish dentistry upon an autonomous basis; and the present-day educational objective is predicated on the definite interdependence of these two educational approaches.

The evolution of dental education coevally with medical education has demonstrated conclusively that while much of the knowledge of medicine is desirable and necessary in the education for and practice of dentistry from the standpoint of its biologic aspects, all of the knowledge of medicine is by no means necessary for the intelligent and efficient

practice of the dental branch of the healing art. We have, in the development of this biologic relationship, taken as much of medical education as we believe is necessary to attain our objective. The inclusion of the internship as part of the preparational dental course is but an extension of the concept of the intimate relation of some dental diseases to systemic conditions.

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much toward enlarging the scope of dentistry and extending its efforts into yet broader fields of health endeavor.

The dental profession, as a separate and autonomous profession, has practically just begun its transition from a sociologic standpoint. We have abundantly proved our right to be considered a specialty of the great healing art, and the advantage which can come from the service of the intern is a definite step toward equipping ourselves for new and enlarged responsibilities in health service to the public.

The practices of medicine and dentistry are becoming more interdependent with recognition of the relationship of dental disease to bodily health, and the medical or dental practitioner who fails to take advantage of the benefits which closer association of the two professions can afford is neglectful of his moral and legal obligation to the public. The internship service which many hospitals and health institutions are offering to the dental graduate will tend to increase the diagnostic and surgical skill of the dentist and enhance his value in collaborative health efforts. It is in this respect that the dental intern can assume his professional responsibility as an indispensable aid in the control of systemic disease and in promoting recovery of hospitalized patients.

Widely compulsory intern service for the dental graduate will make it necessary to enlarge our internship facilities, and there is now actively at work a committee of the American Hospital Association on Dental Care and Internships in Hospitals on which there are two representatives from the American Dental Association, its purpose being to formulate basic standards of hospital dental service and to provide dental internships as they are demanded. There are now about two hundred and thirty dental internships available—more than are being filled—and we do not anticipate any shortage in this respect. In fact, dental internships have been made available in many institutions when attention has been directed to the need, and with increasing appreciation of the dental service.

BIBLIOGRAPHICAL

The Graphic Drama of Dental Caries

By THADDEUS P. HYATT, F.T.S., D.D.S., F.A.C.D., and DR. ALFRED J. LOTKA, Assistant Statistician of the Metropolitan Life Insurance Company, with the cooperation of Dr. H. Shirley Dwyer and Helen McNally, D.H. Paper. Mimeographed.

These valuable charts present some of the statistical characteristics of dental caries collected by Dr. Hyatt and his co-workers and based on the examination of 12,753 persons, male and female, from 16 to 60 years of age. The information accumulated by these examinations has been transposed into seven series of charts, which graphically indicate the incidence of caries on the various surfaces of the teeth as divided into five year age groups. From these charts, several facts of importance are immediately apparent. For example, there is a higher coefficient of correlation between caries on the mesial and on the distal surfaces of adjacent teeth than on the mesial and the distal surfaces of the same tooth. These charts indicate the greatest areas of susceptibility of individual teeth in various age groups. The statistics accumulated should be of great importance to the research worker gathering evidence on the natural history of dental caries. It provides material for further statistical study and can be put to a variety of useful purposes. The profession is again indebted to Dr. Hyatt and his co-workers, for another contribution to the study of dental decay.

Textbook of Oral Pathology

By RUSSELL W. BUNTING, D.D.S., D.D.Sc., Professor of Dental Histology and Pathology, University of Michigan, and THOMAS J. HILL, D.D.S., Professor of Clinical Oral Pathology and Therapeutics, Western Reserve University. Cloth. Price $6.50. 460 pages; 316 illustrations. Philadelphia: Lea and Febiger, 1940.

The second edition of Bunting's textbook, revised and modified by Dr. Hill, is, strictly speaking, a dental pathology rather than an oral pathology; for, with the exception of the last few sections, it is devoted entirely to the dental tissues and their diseases. Thus, one finds detailed and adequate accounts of hypoplasia, calculus, erosion of the teeth, pathology of the pulp and pyorrhea. As is to be expected from Dr. Bunting's interests, a long chapter on dental caries is included, emphasizing the views of the Michigan group. There is a well-written section on periapical abscesses and dental granulomas, adequately illustrated with cuts demonstrating both gross and microscopic pathology. Certain criticisms may be directed to misstatements to be found in the book. For example, on page 347, "The term acidosis does not imply that the blood becomes acid, but that it becomes less alkaline." This certainly does not present a clear picture of what is meant by acidosis, and it is questionable whether this topic should be discussed under the heading of autointoxication. The chemical formula dealing with monosodium acid phosphate (NaH_2PO_4) on page 153 is incorrectly written. The time has passed when a great deal of attention can be paid to such terms as "general suboxidation" or "hyperacid states" in referring to the etiology of certain diseases. It may also be noted that, contrary to the opinion expressed in the text, modern neurologists do not consider unerupted or impacted teeth of importance in the etiology of mental disease or epilepsy. The last sections of the book are devoted to descriptions of certain types of stomatitis, inflammatory tissue changes and tumors of the mouth and jaws. Here one finds, briefly considered, carcinoma, papilloma, epulis, fibroma, osteoma, adamantinoma and odontoma. This section, while not nearly complete, may also be criticized as regards arrangement of the contents. For example, it would have been more conducive to study to group all the tumors of the dental tissues under one head. Instead, one finds thyroglossal cysts in the section with radicular and follicular cysts, and dermoid cysts in the same region;

whereas adamantinoma is discussed after osteogenic sarcoma. Certain of the pictures do not clearly illustrate the condition described. For example, the roentgenograms in Figure 315, which bears the legend "Case of osteitis fibrosa cystica," appear to be typical of osteitis deformans. The illustration of a pyogenic granuloma is difficult to interpret, and the colored plate showing geographic tongue is poorly selected. In spite of these criticisms, there is much of value in the book. The portions on the strictly dental abnormalities and diseases are well-written and in general complete. More careful editing and some rearranging of the contents should greatly improve this volume.

Medical Care (A Symposium). Law and Contemporary Problems

Duke University Law School, Durham, N. C. 1939, Vol. VI, No. 4, 186 pages. 75 cents postpaid.

Private and governmental plans to remove economic barriers to medical care are studied in a symposium on "Medical Care" published as the autumn 1939 issue of *Law and Contemporary Problems,* the Duke University Law School quarterly. The rapid spread of medical and hospital care corporations furnishing service on the prepayment plan and the pendency of the Wagner National Health Bill in Congress together provide the occasion for the publication of the fourteen articles comprising this symposium. After an introductory article analyzing the salient questions presented by the national health problem comes a group of articles directed to experimentation with plans under private auspices. Representative plans are depicted, and the ethical and legal bases of opposition to them are examined. Enabling legislation, already enacted for hospital care plans in twenty-four states and for medical care plans in four, is analyzed, together with problems in the administration of the plans which already have been established.

Five articles in the symposium discuss problems presented by the National Health Bill, introduced by Senator Robert F. Wagner, New York, which would amend the Social Security Act by authorizing federal grants in aid of state public health programs and systems of health and disability insurance. Included among these articles is an analysis of the various bills introduced in state legislatures last winter looking to the establishment of compulsory health insurance systems. A detailed study is also presented of the problems of need, administration and cost to be considered in formulating state or federal disability insurance systems.

Textbook of Physiology

By WILLIAM D. ZOETHOUT, Ph.D., Professor of Physiology, Chicago College of Dental Surgery, and W. W. TUTTLE, Ph.D., Professor of Physiology, College of Medicine, State University of Iowa. Seventh edition. Cloth. 743 pages; 298 illustrations. St. Louis: The C. V. Mosby Co., 1940.

This textbook of physiology is brought up to date in the present seventh edition. As in previous editions, the volume has been designed for teaching a short course in physiology in colleges and certain professional schools. The material covered is essentially that found in larger textbooks, but not so completely discussed. The occasional references to current literature cited can be used for further amplification of certain topics. Throughout the book, a worthy attempt is made to relate the laboratory findings of physiology to clinical problems. An interesting feature of this volume is a glossary containing definitions of the technical terms used throughout the text. This work should be eminently satisfactory for the type of course for which it was designed.

Handbook of the Hospital Corps, United States Navy

Cloth. Price $1.75. 1015 pages. Washington: U. S. Government Printing Office. 1939.

This revised edition of the former Handbook of the Hospital Corps, United States Navy, 1930, compiled from articles prepared by members of the Medical, Dental, Hospital and Nursing Corps of the U. S. Navy, consists of a brief description of all matters pertaining to proper functioning and organization of a hospital corps, as well as technical expositions of many procedures used in medicine, dentistry and pharmacy.

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President's Message

CLEVELAND NEXT
"THE CENTENNIAL YEAR OF AMERICAN DENTISTRY"

IN every state in the Union during the month of March, American dentistry celebrated the centenary of its birth. Later in the same month, in the City of Baltimore, thousands of our members came together in a four-day celebration—a unique and one of the most inspiring occasions in the history of the profession. It is no exaggeration to say that these widespread celebrations were without a parallel in the annals of American dentistry. To all those who contributed to the success of these more than three hundred gatherings are extended the thanks of the American Dental Association. Without the cooperation so freely given, these celebrations could not have been the success they were. The profession owes a debt of gratitude to these willing workers.

But it is not to the past that I wish to call attention, but to the future—not to what occurred in March, of which we are all justly proud, but to what is to take place in Cleveland next September. Perhaps you did not know that the American Dental Association has taken as its slogan for 1940 "The Centennial Year of American Dentistry," and that around that slogan it is engaged in building its program for the next Annual Session. Yet that is exactly what is being done. Great preparations are going forward to make this an outstanding event in this centennial year. In many respects, it too will be unique.

One of the inspiring features of the Baltimore Celebration was the historical exhibits. Probably never in the history of the profession was there gathered under one roof so much of historical interest. Everything having to do with the evolution of dentistry in this country was there, from George Washington's "false teeth" to the most modern equipment in office furnishings. Plans are under way to bring this entire exhibit to Cleveland. Those who saw it in Baltimore will wish to see it again, for it was so vast that no one could obtain a comprehensive view of it in the time at his disposal on that occasion. Those who were not so fortunate as to see it in Baltimore will be given an opportunity to do so in Cleveland.

The program will also be outstanding. The general meetings will be addressed by men of nation-wide prominence. Their acceptance has already been received. Except for the necessity imposed upon the President, no dentist will appear on the program of these general meetings. Every phase of dental practice, however, will be presented

in the section meetings—the best that the dental profession has to offer.

The Local Arrangements Committee is sparing nothing to make your visit to Cleveland both pleasant and profitable. Make your plans *now* to attend. Remember the date: September 9 to 13, 1940, and keep in mind that we are to continue in our celebration of the Centennial Year of American Dentistry.

Arthur H. Merrill

BUREAU OF PUBLIC RELATIONS

SCHOOL DENTAL SERVICE IN NORWAY

By JOHS. GOLI, Oslo, Norway

THE first school dental clinic in Norway was established in Oslo in 1910. From that time, school dental clinics have been established all over the country, in rural as well as urban areas. In 1914, there were twenty-four clinics in fifteen cities and nine rural districts. In 1939, there were school dental clinics in sixty-four cities and 245 rural districts.

In Norway, the elementary school provides dental care for all children from 7 to 14 years of age. The parents receive a card on which they indicate whether they wish to have the child treated. They may desire that the child receive care from their private practitioner. At the present time, few parents refuse school dental service because of lack of understanding of the need of dental treatment. Usually, the school dental service treats from 90 to 100 per cent of the children. The importance of placing the child under treatment when he is first eligible in order to obtain systematic, economic treatment is emphasized. It is made very difficult to obtain care for the child later. In fact, it cannot be obtained unless the teeth are completely treated by a private practitioner. The services at the school dental clinics are free. The average expense varies a little, but is usually about 14 kroner.

WORK OF THE SCHOOL DENTISTS

The educational ordinance provides that school dentists shall examine the teeth of school children and undertake inspection and treatment for the prevention of dental caries and other dental diseases.

Lectures are usually given to pupils and parents regarding nutrition, dental hygiene, etc. Classroom talks, educational hygiene films and pamphlets are also used.

The department of education has developed a card which is used for recording the results of the examination and schools are required to submit statistics to the department of education on the treatment of children. During the examination, school dentists must take note of any irregularity of the teeth and record it as such on the card. Other dental diseases and any malformation must also be noted and recorded.

It is also required that the dentist notify the parents or guardians of the results of his examination and of the steps necessary for correction, so that action may be taken in time.

The service includes filling and prophylaxis. In some cities, surgical care and orthodontic treatment are also provided.

Oral hygiene is considered an integral part of the school program. The personal contacts of school dentists with students permit the dentist to play an important rôle in the education program. Some areas also have appointed dental nurses.

In the cities, treatment is carried on in the school building. In rural districts, are six a day, six days a week for forty weeks. The dentist is usually permitted to have a private practice in the afternoon.

The teeth of the Norwegians are extraordinarily bad. Two-thirds of the children in Norway from 2 to 3 years of age have caries, and, at the age of 7, about 98 per cent. In Oslo, statistics show that, at the age of 11, 50 per cent of all teeth have been filled. The objective of the school dental service is to fill all savable permanent teeth. This is done by using the utmost care in cavity preparation and by using permanent filling materials as far as possible.

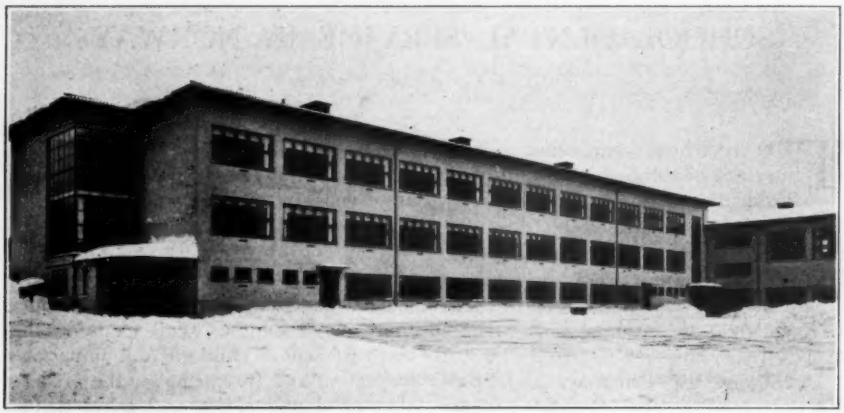


Fig. 1.—Smesbad School.

often the office of a private practitioner is employed during school time. A supervisor appointed by the board of education controls the work, usually with the aid of an advisory committee of the dental association.

The dentist is nominated as a municipal official and he cannot be dismissed except in case of a grave offense. He is encouraged to continue in this work by a rising salary scale and assurance of a pension after a certain number of years of service. The salary is 6,500 kroner per year, plus 500 kroner after three, six and nine years of service. The working hours

The second objective is to remove any source of chronic infection. To assure this, there is a strict rule that all softened dentin must be removed. All teeth, both deciduous and permanent, having pulps infected by caries or non-vital pulps are recommended for extraction unless considered savable for other reasons.

In the posterior teeth, ammoniacal silver nitrate, reduced with eugenol, is used, and in the anterior, usually alcoholic solution of thymol. All cavities are filled with amalgam or silicate with cement linings. Full extension for preven-

tion is practiced. In cavities in the anterior teeth, cement or "salvex" is used as temporary fillings and later silicate.

If pulp exposure has been caused by instrumentation and not by carious involvement, pulp capping may be tried. This is checked yearly by means of the x-rays. If exposure is the result of a carious involvement, the tooth is usually removed. In a permanent incisor, pulp-canal therapy is carried out. A rubber dam is always applied. An x-ray film is taken at the last appointment to determine whether the pulp chamber has been properly filled.

Prophylactic fillings are placed, with full extension for prevention, in fissures and pits of permanent molars considered possibly susceptible to caries. Partially erupted molars are examined as carefully as possible to determine their susceptibility. If the explorer sticks in a pit or fissure, the overlying gum tissue is incised so that immediate filling can be done. In such cases, copper amalgam is usually used.

Fig. 2.—Dental clinic in Sinsen School, Oslo.

MUNICIPAL PUBLIC DENTAL TREATMENT BEFORE AND AFTER SCHOOL AGE

In January 1938, the City Council of Oslo decided to establish municipal dental treatment. A feature of this treatment is the health center established in Sagene Parish. Its principal objective is the prevention of disease in pregnant women and preventive treatment for infants. All pregnant women are encouraged to visit the health center once a month during the first seven months of pregnancy, twice during the eighth month and weekly during the ninth.

Later, examinations are made and treatment provided for the infants once a month during the first half year and every other month during the second half year. Small children up to the age of 7 are examined three or four times a year. If the experiment, which was begun in December 1938, proves satisfactory, it is intended to gradually expand this preventive work to include the entire city.

A central dental clinic has also been

established affording treatment for children under as well as those over school age. Treatment, preferably of a conservative nature, is given. It is the assumption that, in time, treatment will be offered up to the age of 21 years.

OSLO BREAKFAST

In connection with the school dental service, it might be appropriate to mention an important feature in the construction work to maintain the health of school children. This is the school breakfast, or the Oslo Breakfast, as it is called nearly all over the world.

The underlying idea of the Oslo Breakfast is that if the children are to be given one meal at the school, it should be breakfast, not dinner as was common previously. In order to increase the desire to work and to maintain strength during a long and tiresome school day, breakfast naturally is the most important meal of the day.

The Oslo Breakfast is served three-quarters of an hour before classes begin. Half an hour is devoted to breakfast, followed by fifteen minutes in the open air. The breakfast consists of one hard biscuit or piece of hard tack with vitaminized margarine and with cheese, or wholemeal bread with margarine and cheese; codliver paste; one-third of a quart of whole milk; one carrot, and half an apple or half an orange. With the permission of the parents, this meal is given to all children attending the elementary schools of Oslo.

There is no red tape at all to getting this meal, and very often children from the best families take it, because the children very often have a better appetite when they are with other children than when at home. It is entirely free

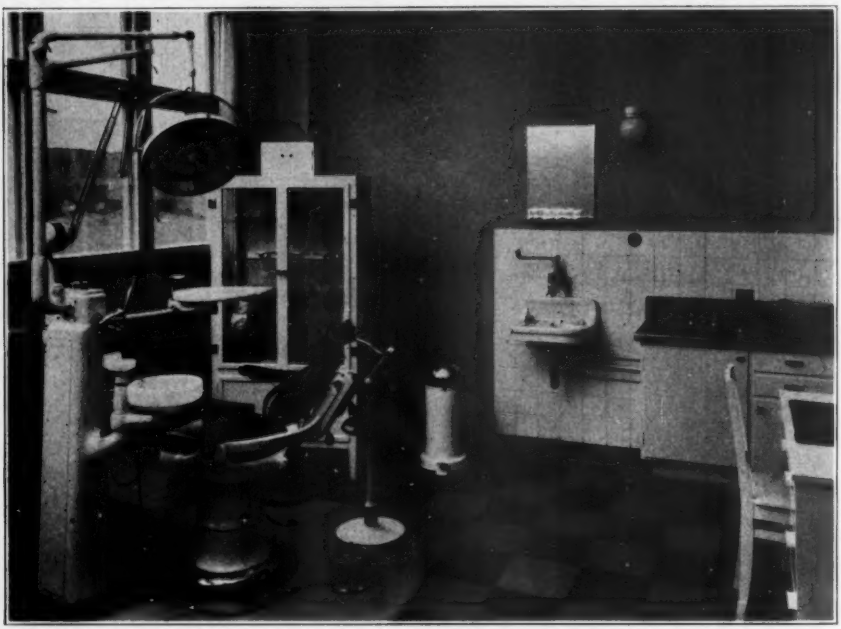


Fig. 3.—Dental clinic in Smesbad School.

and is very popular. This form of nutrition is widely adopted in private homes so that a simpler and sounder diet generally is being evolved.

The Oslo Breakfast has been adopted by all public schools in Oslo, Bergen, Trondheim, Stavanger, Troms, Harstad, Hamar, Sarpsborg, Horten and Porsgrunn, and recently by some rural schools. It is also used in some schools in Sweden, Finland and Copenhagen.

Prof. Carl Schiotz developed this form of school meal. An experiment in comparison with the former school lunch is described in *Nordisk Hygienisk Tidsskrift* (volume 12, part 1-2, 1931). The results after six weeks' tests were as follows: The boys eating the school breakfast gained on an average of 886 gm. per person; those eating a school lunch, 600 gm. The girls eating the school breakfast gained 428 gm. That is, with very nearly similar material (the two schools are socially and hygienically equal), the weight increase for the boys eating breakfast exceeds that of the boys eating lunch by 48 per cent. For the girls, the increase of the breakfast eaters exceeds that of the lunch eaters by 140 per cent. There was no difference between the two schools other than the composition of the meals. The calculations are made with all statistical precautions.

Excellent results have also been demonstrated by comparative tests in Bergen, Stavanger and Helsingborg.

PURPOSE AND PLANS OF MOBILE DENTAL UNIT
TEXAS STATE DEPARTMENT OF HEALTH

I. PURPOSE

REALIZING that the incidence of dental disease is far in excess of the facilities and means for its prevention and correction, and believing that only through an adequate program of education can a reasonably satisfactory solution of the problem ever be obtained, and further believing that only through a realization of facts and through experience is education most effective, the Texas State Department of Health has initiated the following program as a demonstration and for approval. It is the purpose of the program to demonstrate a practicable and economical method of teaching dental health to our youth and to the public with a view to higher evaluation of this requisite to health and happiness and, incidentally, as a benefit to the dental profession.

II. GENERAL PLAN

A. The plan is half educational, half clinical.

B. The personnel consists of a staff dentist assigned to the trailer.

C. The equipment is as follows:

(a) A larger trailer with built-in cabinet features, drawn by a panel truck, all white.

(b) A new modern chair, unit, cabinet, cabinet sterilizer, air compressor, watertank with air pressure, built-in seats, wash basin, necessary instruments and supplies, emergency foot engine, etc.

D. The unit is available for:

(a) Counties having health units or nursing services affiliated with the state department of health (county units preferred).

(b) Rural and small town schools, with educational features for larger cities.

E. It is provided that:

(a) The plan be approved by the local dental society or dentists of the county.

(b) Dentists appoint an advisory committee of local dentists as a governing body, this committee to have final voice in all activities.

(c) Local dentists agree to inspect all children of schools to be included.

F. The procedure is as follows:

(a) The unit becomes a part of the county health service while operating in a given county.

(b) The county nurse or nurses assist in preliminary organization, records, "screening" and educational and clinical services.

(c) From the list of lower elementary children with defects, a list of low-bracket indigent children is selected for free services of simple dental care (amalgam and cement fillings, extractions, prophylaxes and necessary treatments). These children must be unable to pay for services.

(d) The "screening," or weeding out, is done by a local, satisfactory bona fide welfare agency or agent agreeable to the advisory committee of dentists and to the director of the county unit.

(e) The list of eligible children is presented to the dental advisory committee with the request that each member remove any or all doubtful names and then O. K. the remainder in writing.

(f) Cards requesting that the necessary work be done are sent by the teacher to parents or guardians of the eligible children for their signatures.

(g) The school is notified as to the date and is requested to invite patrons to the school the first day. At this time, motion pictures are shown, a dental health education talk is given, the program and plans are explained and an invitation is extended to inspect the trailer. This serves to facilitate the procedure, elevate dental health in the minds of the community and establish confidence and friendship.

(h) Teachers are given information

Fig. 1.—Dental truck and trailer.

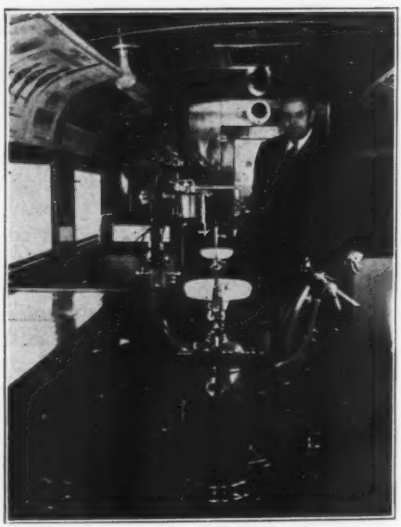


Fig. 2.—Interior of trailer.

and any available material to be used in teaching dental health. The method of teaching is to be left to them, following suggestions by the unit operator.

(i) Teachers are given to understand that it is largely their program and responsibility. With the friendship that by now has been established, the teacher is impressed with the fact that the success of the program will be measured by his or her follow-up—by the number of children who are tactfully induced to go to their family dentist for necessary corrections and by the reduction of the incidence of defects at the close of school.

(j) Child patients are introduced to the clinic in small groups to observe the educational exhibits in the trailer and the operative procedure and for the psychologic effect. (Actually, the whole program is educational, the clinical phase serving to round out and complete the educational phase.)

(k) A nurse from the county unit is designated to assist the operator. She is to assist in organization, operation, record keeping and general office maintenance.

(l) The time to be spent in a given county is not to exceed from six to eight weeks during the school term, in order that a greater number of counties may be reached.

(m) Through the school vacation months, the trailer is returned to the counties previously visited, as a part of the summer round-up program of the county unit, when it is to take care of the preschool children. This should greatly reduce the clinical needs of the first grade the following school year.

G. The results of the program are:

(a) A higher evaluation of dental health on the part of the public.

(b) Relief for practicing dentists from a part of their charitable work.

(c) A greater volume of paid-for dental service through the follow-up urge and opening of the new field of children's dentistry in many communities.

III. RÉSUMÉ

This program is experimental and is intended as a demonstration, subject to the approval of the dental profession, public health workers, the public schools and the public generally. It is hoped that it may offer at least a partial solution of the stupendous problem of dental public health in Texas, and perhaps in other states, and that it may prove to be a benefit not only to the public, but to the dental profession as well. It is also hoped that it will tend to satisfy the apparent growing demand for so-called socialization. In any case, that seems to be the consensus of the far-sighted element of the dental profession in Texas.

Further details will be furnished gladly if inquiries are addressed to Dr. George W. Cox, State Health Officer, State Department of Health, Austin, Texas.

MARCH 11 DENTAL CENTENNIAL PROGRAMS

MARCH 11, 1940, Dental Centennial celebrations were held simultaneously by 316 of the 429 district and component societies of the A.D.A. Most of the celebrations were in the form of dinners. It is estimated that there were at least 500 dinners since many of the larger societies held two or more celebrations in various cities. Every state in the Union, the District of Columbia and three Canadian societies participated. Eleven of the states cooperated 100 per cent, each of their component societies taking part.

These nation-wide celebrations helped focus public attention on the progress and contributions of American dentistry and served as a fitting prelude to the

Dental Centenary celebration held in Baltimore, Md., March 18, 19 and 20, 1940.

The A.D.A. Publicity Committee for Centennial Dinners sent twelve letters and two questionnaires to each component society and three letters to each state society officer. The committee furnished the component societies with educational and publicity material to be used in formulating and publicizing their programs. This material consisted of four newspaper releases; two radio talks; one talk for school children; one talk for adult groups; a message from Dr. Merritt, President of the A.D.A.; a comprehensive résumé of dental history; an article entitled "On to Baltimore"; a synopsis for an inspirational talk, "Looking Forward"; three pamphlets: "Dentistry and Government," "A Century of Dental Progress," "What Does the A.D.A. Do for me?" and a dental pledge signed by Dr. Merritt, to be presented to the guest of honor for the evening. This material totaled 55,000 mimeographed pages, 40,000 pamphlets and 350 pledges.

The dinners in themselves were a great success. Many outstanding people were guests of honor. These included governors; senators; mayors; judges and various city officials; school and university authorities; representatives from medical, pharmaceutic, hygienist, nursing and civic groups; the ministry, and prominent older members of the dental profession.

Arthur H. Merritt, President of the A.D.A., was the guest of honor at the dinners held by the First District Dental Society of New York (March 4) and the Hartford, Conn., Dental Society (March 11).

Many of the societies invited the members of the medical profession to be their guests for the evening.

In some instances, the celebration was a combination of a centennial and a testimonial dinner, paying tribute to the older members of the profession and those who have contributed to its progress. San Diego, Calif., paid tribute to L. C. S. Hugo, who graduated from Baltimore College in 1880. The Second District Dental Association of Georgia honored their original organizer, H. H. Williamson. Two dental societies, Winnebago County, Ill., and the Central District Dental Society of Kansas, presented birthday cakes bearing 100 candles to the oldest practicing dentist in each of their societies. The Danville-Champaign Dental Society honored two guests whose combined years of practice exceeded the 100 years of organized dentistry: F. O. Sale, who has practiced for sixty years, and F. M. Conkey, who has practiced for forty-nine years.

In reviewing the progress which dentistry has made, the Montgomery, Ala., Dental Society, with commendable pride, emphasized the fact that, in 1841, Alabama passed the first state law regulating the practice of dentistry.

The Worcester, Mass., District Dental Society had as one of its guests of honor the chairman of the Grotto Circus, who presented a check for $1,200 to the Friendly House Dental Clinic.

There were many interesting displays of old instruments, dental textbooks, documents and dental diplomas. A diploma that is almost 100 years old was displayed by Dr. Price, of Connersville, Ind. The diploma had been presented to his grandfather nearly 100 years ago. Included in a display by the W. D. Miller Dental Society (Ohio) was a diploma dated 1846 from the Virginia Society of Surgeon Dentists, the only original one in existence. One of the Winnipeg (Canada) dentists displayed a diploma issued to Robert Early by the Baltimore College of Dental Surgery in 1844. It is signed by Chapin A. Harris.

Many cities declared a "Dental Health Week" in recognition of the profession's contribution to the health and welfare of society.

Tribute was paid throughout the country to Horace A. Hayden and Chapin A. Harris, founders of the Baltimore College of Dental Surgery and the guiding force in the establishment of the first dental society and dental journal. Tribute was also paid to Horace Wells and William T. G. Morton, who discovered and demonstrated the use of nitrous oxide and ether as general anesthetics.

Many dental societies reported the attendance at their Centennial meetings to be the largest in history. In every respect, the March 11 dinners were an outstanding success. The committee has received hundreds of letters telling of remarkable attendance, inspirational programs and the close cooperation of the laity and allied professions. As stated in one of the letters which the committee received, "We feel this occasion has been a milestone in public relations."

Two national broadcasts were given: Dr. Merritt's speech over NBC, March 11, and Columbia's "Americans at Work" program, March 12. Cooperation was received from local radio stations in allotting time to the local dental societies for dental broadcasts. An electrical transcription of the Cavalcade of Dentistry, made by the St. Louis Dental Society, was broadcast on the Pacific Coast. It was given at the St. Louis and Washington University Alumni meetings and before seventeen local dental societies throughout the country.

Business men cooperated by permitting dental displays in their store windows, consisting of dental educational material, old and new dental instruments and office equipment, old documents and textbooks. In addition to window displays, the San Francisco Dental Society was able to place street car ads telling of "Dental Health Week."

Nearly all of the dental journals and magazines published articles on the Centennial Dinners. *The Public Health Nursing Magazine* and the *American Journal of Public Health* also carried articles on the March 11 dinners.

Newspapers throughout the country were most generous with their space and many excellent editorials were written on dentistry. The *Yakima (Wash.) Daily Republic* printed an 8-page dental section in their March 12 issue. Reprints of an article on dentistry in the *Brooklyn (N. Y.) Eagle* were printed and 10,000 distributed. Several of the dental societies ran full-page paid advertisements on the Centennial.

The A.D.A. Publicity Committee for Centennial Dinners received more than 800 clippings from thirty-six states. The clippings represent at least 50,000 lines of publicity, including many photographs of guests of honor, dental society officers and dental historical scenes. However, the clippings do not begin to represent the amount of publicity that was obtained, merely presenting what has been called to the attention of the committee. Many Centennial Program chairmen stated that they had obtained cooperation from their newspapers, but either they wanted to keep the clippings for their own historical files or were unable to obtain copies at that time.

A.D.A. Publicity Committee for
Centennial Dinners.
HAROLD S. SMITH
LON W. MORREY, *Secretary*
O. W. BRANDHORST, *Chairman*

PINOCCHIO AND JIMINY CRICKET RUBBER MOLDS

DENTISTS who have used the split rubber molds of Snow White and the Seven Dwarfs will be pleased to learn that molds of Pinocchio and Jiminy Cricket are now available. Ever since Pinocchio was first announced by Walt Disney, the

Bureau of Public Relations has been beseiged with requests for these two fanciful characters. Thousands of dentists have found the molds very helpful in children's dentistry. They pour them of plaster and present the models, either plain or painted, to their young patients.

Jiminy Cricket

Pinocchio is 4 inches high. Jiminy Cricket is 3 inches high. The molds sell for 50 cents each. Order from the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, Ill.

Pinocchio

COUNCIL ON DENTAL THERAPEUTICS

ANNUAL MEETING OF THE COUNCIL ON DENTAL THERAPEUTICS

IT is an established principle of the Council on Dental Therapeutics to advise the members of the dental profession and the public of its decisions as soon as circumstances permit. In accordance with this principle, the following items discussed during the last meeting of the Council, which may be of interest to both dentists and manufacturers, are authorized for publication.

The Eleventh Annual Meeting of the Council on Dental Therapeutics was held at the Shoreland Hotel, Chicago, Ill., February 9 and 10, 1940. The following members of the Council were in attendance:

J. Howard Brown, Ph.D., Sc.D., Associate Professor of Bacteriology, Johns Hopkins University, Baltimore, Md.

Thomas J. Hill, D.D.S., Professor of Clinical Oral Pathology and Therapeutics, Western Reserve University, School of Dentistry, Cleveland, Ohio.

Paul H. Jeserich, A.B., D.D.S., Professor of Operative Dentistry, Director of Operative Clinics, Director of Graduate and Postgraduate Education, University of Michigan, School of Dentistry, Ann Arbor, Mich.

Milan A. Logan, Ph.D., Assistant Professor in Biologic Chemistry, Harvard Medical School, Boston, Mass.

Arno B. Luckhardt, M.D., Ph.D., Sc. D., LL.D., Professor of Physiology, University of Chicago, Chicago, Ill.

Harry Lyons, D.D.S., Professor of Peridontia and Oral Pathology, Medical College of Virginia, School of Dentistry, Richmond, Va.

John A. Marshall, Ph.D., D.D.S., Professor of Dental Pathology and Biochemistry, University of California, College of Dentistry, San Francisco, Calif.

Victor C. Myers, Ph.D., Sc.D., Professor of Biochemistry, Western Reserve University, Schools of Medicine and Dentistry, Cleveland, Ohio.

Harold S. Smith, D.D.S., Chairman of the Council, Chicago, Ill.

Harold L. Hansen, Ph.D., Secretary of the Council, Director of the A.D.A. Bureau of Chemistry, Chicago, Ill.

Donald A. Wallace, Ph.D., Associate Chemist, A.D.A., Bureau of Chemistry, Chicago, Ill.

Dr. Paul J. Hanzlik, vice chairman of the Council and professor of pharmacology at Stanford University Medical School, was unable to attend because of illness.

Dr. Theodore G. Klumpp, Chief of the Drug Division of the Food and Drug Administration, was present at all sessions of the Council by invitation.

Dr. Paul Nicholas Leech, Secretary of the Council on Pharmacy and Chemistry of the American Medical Association, and Dr. Franklin C. Bing, Secretary of the Council on Foods of the American Medical Association, attended part of the sessions.

Harold S. Smith was nominated to the Board of Trustees for reelection as chairman of the Council. Paul J. Hanzlik was reelected vice chairman of the Council.

A general survey of the Council's activities during the year gives evidence of continued growth in this phase of the Association's program. This healthy situation bespeaks progress in scientific dentistry and is indicative of improvements in the dental profession's service to the public.

The work of the Council and the Bureau is directed toward the protection of the dental profession and the public. But its functions as an advisory body to the profession and to the public on certain matters have effects which extend beyond those ordinarily attributed to the work of a fact-finding body. It is of significance in this period of economic and social change that the Association does possess scientific agencies whose activities are the subjects of commendatory reports from professional men, other scientific bodies and, pertinently enough, of lay groups and manufacturers as well. Improvement in the quality of dental medi-

PRODUCTS CONSIDERED BY THE COUNCIL FROM JANUARY, 1930 TO JANUARY, 1940

Products announced as accepted in THE JOURNAL	640
Products announced as not acceptable in THE JOURNAL (including Notices of Judgment)	323
Products not acceptable, but reports unpublished	142
Products reaccepted	258
Products omitted from A.D.R.	66
Acceptance, provisional acceptance and reacceptance recommended	122
Acceptance not recommended, still under consideration	0
Awaiting more evidence from proprietor for disposition	9
Products acceptable, announcement delayed	16
Awaiting report of referee	2
Consideration postponed	39
Official drugs in A.D.R.	225
Products examined in the Bureau of Chemistry, findings not published*	203
TOTAL	2,045
Minus items 4 and 5 (reaccepted and omitted products)	324
	1,721
Products discussed in answer to inquiries, etc., not including the above products, approximately	1,050
Total products brought to attention of the Council in one way or another	2,771

*This list includes work on acceptable products checked by the Bureau for conformity with Council provisions, work which has induced manufacturers to institute suitable changes, work done at the request of individual members of the profession, pH and scratch tests on dentifrices and work on which separate reports have not been prepared.

cinals and dentifrices, together with improved methods of testing and evaluating these products, represents other gratifying results of the activities of the Council and the Bureau.

The Council feels that a summary of the products considered over a ten year period is appropriate at this time.

During the first ten years of its existence, the Council's energies were directed in large measure to the criticism of products and advertising inimical to the best interests of the dental profession and the public. It must be noted that a need for such activities still exists. The Council has continued its activities to meet that need.

Fortunately, there are indications that sufficient groundwork has been laid to permit the Council to spend more time on purely constructive enterprises. A growing favorable ratio of acceptable to unacceptable products is one indication of the present trend. In this connection, it is well to recognize that the Council's activities are designed to be informative and not punitive. Products which have been the subjects of one or more reports holding them unacceptable are still eligible for favorable consideration under the Council's rules. It is understood that favorable consideration is contingent upon acceptability of the products from the standpoint of composition, and receipt of the manufacturer's or agent's written agreement to abide by the Council's rules on advertising. On that basis, which is clearly defined in its published rules, the Council has accepted the Pepsodent dentifrices and Kolynos Tooth Paste. Reconsideration of these articles, with a view to renewal of acceptance, will be undertaken at the time of expiration of the usual period of acceptance in accordance with the rules.

FEDERAL REGULATORY AGENCIES AND THE COUNCIL

In accordance with a procedure of long standing, the Council has continued publication of reports of actions taken by the Federal Trade Commission and the Food and Drug Administration on matters of interest and importance to the dental profession. From these reports, it may be inferred that the activities of these agencies have been broadened and intensified by recent legislation. A general review of the new laws has appeared in another issue of THE JOURNAL (27:80, January 1940).

The Council was organized as an independent scientific body within the Association. The enactment of recent Federal laws has not changed that status, and the activities of the Council are carried out in harmony with the general provisions of the new laws. In fact, many of the provisions of the new laws embody principles which have guided the scientific bodies in the A.M.A. and the A.D.A. over a period of many years.

The part of the Food, Drug and Cosmetic Act requiring a statement of qualitative composition on the package labels of drugs, for example, represents official acknowledgment of the undesirability of secrecy in connection with the sale of medicinals. This indicates only one of the respects in which the work of the Council and the Bureau is strengthened by the new laws. Unfortunately, the law does not require a quantitative statement of composition, and without this, complete appraisal of a drug or therapeutic preparation cannot be made.

While it might have been expected that the enactment of the recent Federal laws would serve to lighten the Council's burdens, this hope has not been realized. On the contrary, there has been an increase in the Council's work. This situation is due in large measure to the circumstance that the federal agencies are administrative bodies. They must still rely upon scientific groups and individuals for appraisal of therapeutic products and procedures.

The views of an official of the Food and Drug Administration on the work

of this Council and similar bodies will be of interest to members of the dental profession. These views were expressed in a recent article (*J.A.M.A.*, 113:2233, December 16, 1939) as follows:

With the enactment of more effective regulation of foods, drugs, devices and cosmetics, the question of how this legislation will affect the work of the Council on Pharmacy and Chemistry, the Council on Foods, the Advisory Committee on Advertising of Cosmetics and Soaps of the American Medical Association and other similar groups has been raised. It has, in fact, been thoughtlessly intimated that the work of these councils would be in the main unnecessary. In a recent address, the Secretary of the Council on Pharmacy and Chemistry pointed out the fallacies of such a concept. In his informal discussion of the topic, he pointed out the respects in which the new Food, Drug and Cosmetic Act and the rules of the Council are similar in purpose, as well as the respects in which they differ in function. The protection of the public from adulterated, misbranded and dangerous drugs, devices, cosmetics and foods is a large and never ending task. It is fitting that groups such as the American Medical Association and the American Dental Association, which have an interest in public health and welfare, should participate in this work. In this as in other functions of a democratic form of government, public welfare is served best when there is a vigorous public interest and participation in the activities of government.

DENTIFRICES

A comparison of the dentifrice situation ten years ago with that prevailing today leaves no doubt that the Council's efforts in this field have had important results. Evidence for this belief comes in several forms:

(a) An increasing knowledge of the nature and function of dentifrices on the part of the public and particularly on the part of school teachers and students.

(b) An increase in the number of acceptable dentifrices, accepted dentifrices being available everywhere.

(c) A readily apparent increase in the number of dentifrices for which no unwarranted therapeutic claims are made.

(d) Improvement in the composition of many dentifrices and an active interest in this phase of the work on the part of manufacturers.

Miraculous and speedy changes in a highly competitive field cannot be expected. Reliance must be placed on the "educational" method and on the force of a united profession.

Recently, there has been an increase in the number of liquid dentifrices on the market. These products are not essentially new, as many members of the profession know. Liquid dentifrices were among the best sellers several decades ago. It is of interest to note that these products represent one extreme in the dentifrice field from the standpoint of abrasiveness. Indeed, they were introduced as substitutes for toothpastes and toothpowders, with the claim (direct or implied) that they are not harmful to the enamel, whereas products containing abrasive agents may be. It is conceivable that liquid dentifrices may serve a useful function, particularly in those cases in which the cementum is exposed through gingival recession. On the other hand, available evidence indicates that these products cannot be looked upon as substitutes for toothpastes and toothpowders. Preliminary data indicate that the staining which has been reported in connection with the use of liquid dentifrices appears to be associated with the absence of abrasive agents in these products. At any rate, stains accumulated during use of a liquid dentifrice may be removed with toothpastes and toothpowders. It is evident that some people cannot rely solely upon liquid dentifrices to aid in cleaning the teeth under the usual conditions of use. The usual conditions of use for any dentifrice are admittedly not entirely satisfactory. They must be taken into account, however, and a statement showing the deficiency of the liquid den-

tifrices in this respect should therefore appear on the package label.

During the past year, the Council, through the Bureau of Chemistry, has conducted a survey of toothpastes. The findings indicate that all toothpastes bearing the Seal of Acceptance meet the abrasiveness requirements outlined in THE JOURNAL (24:1817, November 1937). A similar survey of toothpowders is under way. It is suggested that manufacturers of dentifrices keep this test, as well as the quantitative tests for abrasiveness, in mind when preparing new products or revising the formulas of old products.

The activities of the Federal Trade Commission and the Food and Drug Administration on products of this class have been shown in other issues of THE JOURNAL. Recently, the Food and Drug Administration has persuaded manufacturers to institute changes in dentifrice packages. The size of the carton is now being reduced to conform to the size of the actual dentifrice container. This change will be of benefit to the consumer, to the retailer and eventually to the manufacturer.

LOCAL ANESTHETICS

The Council has pointed out on several occasions that the action of local anesthetic preparations is dependent on the drugs contained therein and not on claims made for the products.

The Council has reviewed the evidence made available since the last meeting and has concluded that the information appearing in Accepted Dental Remedies 1939 is not in need of fundamental revision.

The profession has displayed considerable interest in the following topics related to local anesthetic solutions: vacuum packing, monocaine hydrochloride and substitutes for epinephrine.

With respect to the first item, it may be said that vacuum packing has not been shown to check the deterioration of procaine hydrochloride. On the basis of the available evidence, it must be concluded that its effect is limited to prevention of oxidation of the epinephrine contained in the local anesthetic solution while the latter is in the unopened package. Consideration of monocaine hydrochloride has not been completed. A preliminary report appeared in THE JOURNAL (26: 1889-1890, November 1939). The properties and actions of the vasoconstrictors epinephrine, cobefrin and neo-synephrin are discussed in Accepted Dental Remedies 1939.

PRODUCTS MENTIONED IN RELATION TO STUDIES ON DENTAL CARIES

During the past few months, the Council has received numerous requests for information on the following products which have been discussed in relation to studies on dental caries: fluorides, organic peroxides and Zephiran. (Zephiran is stated to be alkyl benzyl dimethyl ammonium chloride.) The Council and its consultants are agreed that no positive statements concerning the routine use of any of these substances in the treatment or prevention of dental caries can be made at the present time. The Council concurs in the opinion of its consultants that the usefulness of these or other substances in the treatment of dental caries must be determined by adequate clinical trial in addition to suitable pharmacologic and toxicologic studies. This is in harmony with the position of qualified research workers in the field who are aware of the many difficult factors in the study of dental caries.

CHEWING GUM

During the course of the year, the Council has received requests for information on chewing gum, from members of the profession and from lay persons. The Council referee has reviewed the available evidence on these products and has concluded that therapeutic claims, direct or implied, are unwarranted. As

far as the Council is aware, the addition of such substances as charcoal and peroxides to chewing gum serves no useful purpose. The addition of vitamins to chewing gum is considered an irrational practice and is not commended.

DIET AND DENTAL HEALTH

That interest of the dental profession in dietary problems is increasing has been shown by the number of inquiries on this topic. A number of inquiries from lay persons is indicative of public interest in diet as related to dental health and also shows the results of high pressure advertising of numerous "dietary products," such as kelp, polyvitamin preparations, "all purpose foods" and other preparations.

In several reports, the essential conclusions of which have been incorporated in Accepted Dental Remedies, the Council has pointed out that:

1. Diets adequate for good general health meet the nutritional requirements for dental health. Addition of calcium tablets and vitamin preparations to an adequate diet has not been shown to be of value in the treatment or prevention of dental disease.

2. The dentist is in a good position to contribute to the welfare of his patients through cooperation with physicians.

The new book "Accepted Foods and Their Nutritional Significance," by the Council on Foods of the American Medical Association, contains a wealth of information of interest and importance to dentists.

Recently, there has been considerable progress in the vitamin field with respect to both the biologic and the chemical aspects of this important work. The Council feels that the newer discoveries relating to vitamin B complex and vitamin K are of sufficient interest to warrant the preparation of informative reports, which will appear in this section of THE JOURNAL.

RELATIONSHIP WITH THE PROFESSION

The Council is appreciative of the numerous letters received from members of the profession during the past year. The sustained interest shown by such correspondence is an inspiration to the members of the Council and convincing evidence of the dentist's desire to be fully informed on matters within our purview. Over a period of years, the Council and the Bureau have gathered information on topics related to dental medicinals and dentifrices. This information can be had on request.

The action of the elected representatives of the Chicago Dental Society relative to commercial exhibits represents an important step in the development of the Association's program. The Chicago Dental Society is to be highly commended on restricting its exhibits of therapeutic products to those bearing the Seal of Acceptance. Similar action on the part of component and constituent societies whose policy with respect to commercial exhibits is not in harmony with that of the Association would assuredly result in changes beneficial to the profession and the public.

During the past year, the Council exhibit was displayed at the following meetings: Illinois State Dental Society, Chicago Midwinter Meeting, Golden Gate Dental Congress, St. Louis Dental Society and Minnesota State Dental Society. The Council is indebted to Ralph B. Rode and L. C. Gyllenborg for presenting the Council exhibit at the St. Louis and Minnesota meetings.

The Secretary appeared before the following societies, in addition to several lay groups: Milwaukee County Dental Society, West Suburban Dental Society, North Suburban Dental Society, Southwestern Michigan Dental Society and Sixth Councilor District, Wisconsin Dental Society (Racine).

INFORMATIVE ARTICLES

During the year, the following inform-

ative articles appeared in the Council's section of THE JOURNAL:

"Significance of Tests for the Evaluation of Antiseptics and Germicides," by Holmes T. Knighton, D.D.S.

"Zinc Oxide-Eugenol Cements," by Donald A. Wallace, Ph.D., and Harold L. Hansen, Ph.D.

"Sulfanilamide."

"Oral Bacteriology: Basic Consideration Bearing on Disease and Therapy," by Basil G. Bibby, B.D.S., Ph.D.

"Antibacterial Effects of the Organic Mercurial Compounds," by John H. Brewer, Ph.D.

Several other articles on timely topics are now under consideration.

ACCEPTED DENTAL REMEDIES

The fifth edition of Accepted Dental Remedies was presented in September 1939. The reception accorded each edition of this work amply justifies the time and expense involved in its preparation. At the present time, approximately 23,000 copies of the various editions have been distributed. The Council reminds the profession that worth while changes are made in each edition.

CORRESPONDENCE WITH THE PUBLIC

During the first few years of its existence, the Council's contacts with the public were naturally limited. The interest in the Council's work has grown from year to year. During the past year, the Council office received more than 5,000 requests for information. Many of these came from teachers and students, representing groups of individuals. Others came from consumer organizations and better business bureaus.

COUNCIL CONSULTANTS

The Council expresses its appreciation for the helpful services rendered by the members of the Contact Committee of the Board of Trustees, Drs. Meisel, Morgan and Timmons.

During the past year, the following men have contributed to the work of the Council: Basil B. Bibby, Raymond Bieter, Franklin C. Bing, John H. Brewer, Stanley W. Clark, E. M. K. Geiling, Philip Jay, Paul C. Kitchin, H. T. Knighton, Rudolf Kronfeld, Paul Nicholas Leech, G. R. Lundquist, Theodor Rosebury, M. H. Seevers, C. M. Suter and M. L. Tainter.

PRESCRIBING SUGGESTIONS

THE rational use of drugs and chemicals is an essential part of dental practice. Over a period of years, the Council has issued numerous reports designed to aid the dentist in the selection of drugs and chemicals of demonstrated usefulness. Many of these are National Formulary and U. S. Pharmacopeial substances, listed and adequately described in Accepted Dental Remedies 1939. In order that the dental profession may use acceptable and official products to the best advantage, the following formulas have been suggested.

The Council appreciates the cooperation of George C. Schicks, assistant dean of Rutgers University and chairman of the Committee on Dental Pharmacy of the American Pharmaceutical Association, in the preparation of the formulas.

SERIES V

SALINE MOUTH RINSE

(Pink)

	Metric Approximate Equivalents	Apoth.
a)		
℞		
Calcii Oxidi	2.0 gm.	3 ss

Phenolphthaleini	0.10 gm.	gr. iss
Saccharini Solubilis	0.36 gm.	gr. vi
Olei Cinnamomi	0.60 cc.	m. ix
Sodii Chloridi ad.	120.00 gm.	℥ iv

*M. et fiat pulvis siccus

Sig: ¼ teaspoonful to a cup of warm water for mouth wash.

Note: Flavor may be changed by using eucalyptol 0.06 cc. and methyl salicylate 0.5 cc. in place of oleum cinnamomi. Makes a pleasingly colored and flavored salt solution.

*Means make a dry powder.

LIQUID DENTIFRICE

b)

℞	Metric Approximate	Apoth. Equivalents
Pulv. Saponis	7.20 gm.	℥ ii
Glusidi	0.24 gm.	gr. iv
Liq. Amaranthi	1.00 cc.	m. xv
Olei Cinnamomi	0.60 cc.	m. ix
Olei Menthae Piperitae	0.60 cc.	m. ix
Olei Caryophylli	1.20 cc.	m. xviii
Alcohol	90.00 cc.	℥ iii
Aquae Dest. q.s. ad.	120.00 cc.	℥ iv

M.

Sig: Sprinkle on moistened brush and use as dentifrice.

Note: Soluble dentifrice for daily use.

TOOTH POWDER

c)

℞	Metric Approximate	Apoth. Equivalents
Pulv. Saponis	6.0 gm.	℥ iss
Saccharini Solubilis	0.30 gm.	gr. v
Olei Menthae Piperitae	0.48 cc.	m. viii
Methylis Salicylatis	0.96 cc.	m. xv
*Calcii Carb. Praec. ad.	120.00 gm.	℥ iv

Sig: Use on moistened toothbrush.

Note: Alkaline toothpowder—replace portion of calcium carbonate substituting one of the following:

Mag. Oxide	48.0 gm.	℥ iss
Sod. Borate	25.0 gm.	℥ vi
Sod. Bicarb.	60.0 gm.	℥ ii

*See A.D.R. for list of brands accepted by Council on Dental Therapeutics.

MOUTHWASH

d)

℞	Metric Approximate	Apoth. Equivalents
Acidi Borici	6.00 gm.	℥ iss
Thymolis	0.24 gm.	gr. iv
Chlorthymolis	0.24 gm.	gr. iv
Mentholis	0.24 gm.	gr. iv
Eucalyptolis	0.48 cc.	m. viii
Methylis Salicylatis	0.28 cc.	m. v
Olei Thymi	0.07 cc.	m. i
Alcohol	72.00 cc.	℥ xviii
Aquae. Dest. q.s. ad.	240.00 cc.	℥ viii

Note: Can be obtained by writing for liquor antisepticus, N.F.*

*National Formulary, p. 219

Mouthwashes have no demonstrated therapeutic value. Liquor antisepticus may be regarded as a pleasantly flavored mouth rinse.

MOUTHWASH

e)

℞	Metric Approximate Equivalents	Apoth.
Potassii Bicarbonatis	2.40 gm.	gr. xxxvi
Sodii Boratis	2.40 gm.	gr. xxxvi
Thymolis	0.06 gm.	gr. i
Eucalyptolis	0.12 cc.	m. ii
Methylis Salicylatis	0.06 cc.	m. i
Tr. Persionis	2.40 cc.	m. xxxvi
Alcohol	6.00 cc.	℥ iss
Glycerini	12.00 cc.	℥ iii
Aquae. Dest. q.s. ad.	120.00 cc.	℥iv

M.

Sig: Use with equal parts of water for mouth rinse.

Note: Alkaline mouth wash—use plain or diluted. Can be obtained by writing for liquor aromaticus alkalinus, N.F.*

*National Formulary, p. 221.

MOUTHWASH NO. 3 PLAIN

f)

℞	Metric Approximate Equivalents	Apoth.
Mentholis	0.12 gm.	gr. ii
Thymolis	0.12 gm.	gr. ii
Saccharini Solubilis	0.09 gm.	gr. iss
Eucalyptolis	0.60 cc.	m. ix
Methylis Salicylatis	0.12 cc.	m. ii
Alcohol	38.00 cc.	℥ ixss
Aquae Dest. q.s. ad.	240.00 cc.	℥ viii

M.

Filtra talc.

Sig: Dilute with equal parts of water for mouthwash.

Note: Base mouthwash to which other ingredients can be added.

To change flavor replace eucalyptus with oil of sassafras, and methyl salicylate with oil of anise. Dilute or not for office atomizer. Alcohol—approx. 15 per cent.

FLAVORED SODIUM PERBORATE

g)

℞	Metric Approximate Equivalents	Apoth.
Sodii Perboratis	120.00 gm.	℥ iv
Carmine No. 40	0.30 gm.	gr. v
Olei Cinnamomi	2.50 cc.	m. xl

Misce.

Dispense in glass bottle.

Sig: Use as toothpowder or dilute with three parts of water as mouthwash.

Note: Sodium perborate is recommended only in treatment of disease conditions under professional supervision.

DOBELL'S SOLUTION

h)

℞	Metric Approximate Equivalents	Apoth.
Sodii Boratis	3.6 gm.	gr. lvi
Sodii Bicarbonatis	3.6 gm.	gr. lvi

Phenolis Liq.	0.72 cc.	m. xii
Glycerini	8.4 cc.	m. cxxxvi
Aqua Dest. q.s. ad.	240.0 cc.	℥ viii

Misce.

Sig: Tablespoonful in glass of water as a mouthwash.

Note: Write for by official title: Liquor Sodii Boratis Compositus, N.F.* (Dobell's Solution.)

For dental spray bottle, dilute 5 times with water.

*National Formulary, p. 242

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

SORBITOL SYRUP

Sorbitol Syrup: A product consisting essentially of d-sorbitol $C_6H_8(OH)_6$, together with a controlled amount of closely related polyhydric compounds.

ACTIONS AND USES: Sorbitol Syrup, prepared by reduction of dextrose, is proposed for use as a dentifrice ingredient. It functions as a plasticizing and binding agent. Laboratory and clinical data indicate that it is no more irritating to oral tissues than is glycerol. Its systemic toxicity is of the same order as that of the sugars dextrose and sucrose. It is asserted that soribitol is metabolized more slowly by human beings than is glucose.

Atlas Commercial Sorbitol Syrup (Introduced as Sorban).

Manufactured by the Atlas Powder Company, Wilmington, Del. U. S. Patent No. 2,172,357.

PROPERTIES: Sorbitol syrup is a non-crystallizing, viscous liquid with a faint caramel odor and a sweet taste. The product is clear and colorless or very pale amber. It is non-volatile and hygroscopic. It is miscible in all proportions with water and methyl alcohol; and with an equal volume of 92.5 (vol.) denatured ethanol (S D No. 1). It is also miscible with pyridine, the ethanolamines, morpholine, phenol and acetic acid. It responds to Fehling's and to Benedict's test (presence of reducing compounds). It does not respond to the acrolein test with potassium acid sulfate (differs from glycerol).

Atlas Commercial Sorbitol Syrup is stated to conform to the following specifications:

Polyhydric content	83.0 ± 0.1%
Sodium sulfate	Not more than 0.75%
Reducing substances, as dextrose	Not more than 0.20%
Water	16 ± 0.25% (to make 100%)
Heavy metals	Not more than 0.0008%
Specific gravity	1.315-1.322
Refractive Index at 25°C.	1.481-1.487
Viscosity 25°C.	3300 ± 300 centipoises

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

RESEARCH COMMISSION

ACRYLIC RESINS*

INTRODUCTION

DURING the last few years, the methyl methacrylate resins (Vernonite, Crystolex, Lucitone and Densene are among the trade names by which the material is identified) have been extensively and successfully used for denture bases. That there has been much controversy regarding the sale and use of this material is attested by the large number of inquiries which the Commission has received. The following statement is offered in the hope that some of this confusion may be clarified.

RESEARCH COMMISSION ACTIVITIES

The Research Commission has kept in close touch with the developments of these tissue-colored denture-base materials and, for the last five years, has made tests on those which gave promise of possible satisfactory service. Reports by research workers stationed at the National Bureau of Standards have appeared from time to time in THE JOURNAL. Fortunately, these reports have pointed out defects in certain types of resins and have undoubtedly protected the profession against obsolescent materials pushed by high pressure sales methods.

MANUFACTURE

In this country, the methyl methacrylate resins are made by two firms, the Rohm & Haas Co. and the Du Pont Co.

CONTROL OF PATENTS

The patents covering the process of molding a monomer-polymer (powder-liquid) methyl methacrylate resin and the use of the resin for denture bases are controlled by the Du Pont Co.

*A statement to the members of the American Dental Association from the Research Commission.

DISTRIBUTION

The Du Pont Co., through its patent control, issued licenses to Rohm and Haas Co. and its distributors, the Vernon-Benshoff Co. (Vernonite) and the Kerr Dental Manufacturing Co. (Crystolex). The Du Pont Co. gave an exclusive license to the L. D. Caulk Co. to distribute the Du Pont product (Lucitone). To the best of the Commission's knowledge, no other manufacturer or distributor is licensed to sell methyl methacrylate for denture bases under the Du Pont patents. Nevertheless, aside from the above-mentioned distributors, there are many concerns that are distributing the resin for denture purposes. Examples of such reportedly unlicensed concerns are Cosmos Dental Products Co. (Densene); AC Ril Dental Corporation (AC-RIL); Acralite Co. (Acralite), and Precision Laboratories (Livetone). Many other resins are distributed surreptitiously without even a brand name or the name and address of the distributor or maker. These unlicensed brands are often referred to as "bootleg" articles. It is reliably reported that the source of supply of these unlicensed resins is concerns that use the resin in molding commercial ware. It has also been reported that legal actions have been instituted to stop the sale of methyl methacrylate resin for denture purposes by other than duly licensed distributors. This matter must be decided by the courts.

PRICE

The selling price of the unlicensed material is usually less than that of the licensed brands. The difference in price between the resin as sold for commercial molding purposes and as sold for dental use is great. This price difference is attributed to the necessity of closer pro-

duction control, the small batches and greater uniformity and purity, research, method of packing and distributing, etc.

PHYSICAL PROPERTIES

The Research Commission at this date does not have sufficient information to warrant a statement regarding the relative merits or properties of the licensed and unlicensed articles. However, it is expected that an A.D.A. Specification for Methyl Methacrylate Resin will be available by the time of the national meeting in September. When the specification is adopted, the profession will have a yardstick by which these resins can be evaluated. Later, a list of certified acrylic resins will be published so that the profession may know what materials comply with the specification. However, since such a list of resins will not be available for many months, the Research Commission plans to publish a paper giving the physical properties of approximately twenty denture bases in current use. In this report, which should be available by the time of the September meeting, the materials will be identified by trade brand names.

FORMS OF METHYL METHACRYLATE RESIN

The resin is sold in two forms: as a plastic cake or as a powder and a liquid which, when mixed by the dentist, can be formed into a plastic cake. Either form of the resin, when cured, changes to the solid state, the polymer. The powder portion of the powder-liquid combination is the finely divided polymer. The liquid portion is usually the resin in the monomeric form. This, when heated or subjected to ultraviolet light, hardens to form the polymer. The plastic cakes usually consist of a mixture of the liquid (monomer) and the powder (polymer). The physical properties of resins made from either the plastic cake or the powder-liquid combination show them to be equally satisfactory for dentures.

AVAILABILITY OF THE TWO FORMS

Originally, the resin was sold in the plastic cake (Vernonite and Lucitone) and in the powder-liquid form (Crystolex and the numerous brands of unlicensed origin). Then followed a period when the Kerr Dental Manufacturing Co. was forced by the controllers of the patents to stop the sale of Crystolex in the powder-liquid form. The powder-liquid form was then available only through the unlicensed distributors. It was reported that legal action was being taken to prevent the sale of the powder-liquid form by any one. When it was reported that an effort would be made to suppress its use in denture work, many members of the profession who had expressed a preference for this type of resin made repeated inquiries of the Commission for information as to why they were to be denied this item.

The Commission, through its fellowship at the National Bureau of Standards, had found this type of resin to be satisfactory experimentally and to have certain advantages over the plastic cake type. Feeling that the dentist, by virtue of his professional qualifications and his obligation to the state because of its licensing him to practice, was fully responsible for the selection of what he regarded as the best materials to be used, the Research Commission at once undertook to find out why the dentist was to be denied the acrylic resins in any form in which he might choose to use them.

MANUFACTURERS' CONTENTIONS

The Research Commission communicated with the Rohm and Haas Co. and the Du Pont Company regarding the withdrawal of the powder-liquid form from the market. The companies stated that the reasons for withdrawing the powder-liquid form from the market were technical. Among the reasons cited were these:

1. The monomer (resin in the liquid

form) is explosive and so would be a hazard to the dentist's well-being.

2. Fumes from the monomer may be or are poisonous if inhaled for long periods or in heavy concentrations.

3. Directions had not been followed properly, as they require too much attention to detail.

4. Liquids had been substituted for the monomer (liquid resin).

5. Mixing by machine was superior to mixing by hand, and it was therefore desired to prepare the mix, that is the plastic cake, at the factory instead of having the dentist prepare it in his office.

6. If the one licensed powder-liquid combination (Crystolex) was removed from the market, only the unlicensed materials would be available to the dentist, who could thus easily identify and avoid purchasing the unlicensed products.

RESEARCH COMMISSION'S REPLY

The Research Commission, in replying to these contentions, stated that:

1. Dentists have for years used explosive organic liquids, such as ether and benzine, without undue hazard. The Commission has not heard of any dentist being injured as a result of the burning or the exploding of the monomer.

2. Fumes from many organic liquids are poisonous. This the dentist understands, and he takes precautions not to inhale vapors from benzine, amyl acetate, acetone, etc. No case of poisoning by the monomer has been reported to the Commission.

3. The mixing of the powder and liquid is comparatively simple as compared to the mixing of amalgam or dental cements. The technic is about the least complicated that the dentist uses.

4. The average dentist desires to use the best material available. His time is valuable, and he is not interested in saving a little money by the substitution of an inferior material.

5. Tests conducted by the A.D.A. Research Fellowship at the National Bureau of Standards show that specimens prepared from hand-mixed resin are as satisfactory as specimens prepared from the plastic cake as supplied by the manufacturer. Dentures prepared from the hand-mixed resin have given as satisfactory service as dentures prepared from factory-mixed resin.

6. The removal of the legitimate powder-liquid combination from the market simply forces the dentist to buy materials of this type from the so-called "bootlegger." In addition, the plastic cake can also be "bootlegged." As long as there is the great price differential between the resin as supplied for commercial and for dental purposes, there will be continued sale of the unlicensed brands.

ADVANTAGES OF POWDER-LIQUID COMBINATION

The Research Commission knows that the powder-liquid combination has certain distinct advantages over the plastic cake form. These superior qualities are as follows:

1. The powder-liquid combination is practically age proof, while the plastic cake hardens rapidly at room temperatures and is soon unfit for pressing unless it is kept in a refrigerator.

2. The powder-liquid combination is much more economical since small portions for use in repairing or rebasing or for partial dentures can conveniently be prepared as needed. If the resin is sold as a plastic cake, it is necessary to open a package to obtain a small portion of resin. After the vacuum-sealed package is opened, the plastic cake hardens.

3. The resin formed by the mixing of the powder and liquid by the dentist is more plastic and more easily forced into place than is the stiffer plastic cake supplied by the manufacturer.

4. The resin formed by the mixing of the powder-liquid by the dentist is easily packed in and around metallic appendages, such as clasps and finger springs, of dentures, splints and orthodontic ap-

pliances without displacing the delicate attachments. When the plastic cake as supplied by the manufacturer is used, the attachments are often shifted out of position. This is a serious and unnecessary handicap to the dentist.

5. The shade of the resin formed by mixing the powder and liquid can be easily lightened by substituting some clear powder for part of the tinted powder. The color of the plastic cake cannot be changed by the dentist.

6. The Research Commission is unaware of any essential advantage which the plastic cake has over the powder-liquid form.

POSITIVE ACTION BY THE COMMISSION

The Commission was unable to get a satisfactory answer from the producers or distributors of these resins and therefore called a meeting of its executive board, in Chicago, in February 1940. Manufacturers and distributors were invited to attend this meeting. The three licensed distributors sent representatives. The Commission took a firm stand in its position that the dentist should be the sole judge as to what form of resin he should use and asserted its intention to do all in its power to make available to the dentist these resins in both the powder-liquid and the cake forms.

SITUATION CORRECTED

Shortly after the meeting of the Executive Board, the Du Pont Co. notified the Research Commission that the company had decided to permit the sale of methyl methacrylate denture material in the powder-liquid form by the company's licensed distributors. The Commission expressed its appreciation to the producers for this decision. It is felt that the original decision to remove the powder-liquid combination from the market was made because the individuals or concerns involved were not familiar with the history and development of dental science and dental art, and not with the idea of restricting the dentist in his health duties.

PROCESS PATENT COMMITTEE

DU PONT COMPANY AGREEMENT WITH REGARD TO USE OF ACRYLIC RESINS IN DENTISTRY

IT is suggested that the membership defer signing the agreement sent out by the L. D. Caulk Company, permitting the use of certain forms of acrylic resins for denture bases manufactured by the Du Pont Company. The Process Patent Committee is studying the problem, and further information regarding the patent restrictions and the legal aspects of the agreement will be published in later issues of THE JOURNAL.

M. D. K. Bremner, *Chairman,*
Process Patent Committee
55 East Washington St.,
Chicago, Ill.

THE NATIONAL HEALTH PROGRAM COMMITTEE

MARCH 18, a bill was introduced into the United States Senate, under the sponsorship of the Research Commission and the National Health Program Committee of the American Dental Association, by Senator James E. Murray, of Montana. The bill (S. 3607) authorizes and directs the Surgeon General of the United States Public Health Service "to conduct researches, investigations, experiments, and studies relating to the cause, diagnosis, and treatment of dental diseases; to assist and foster similar research activities by other agencies, public and private, and to promote the coordination of all such researches and activities and the useful application of their results, with a view to the development and prompt widespread use of the most effective methods of prevention, diagnosis and treatment of such diseases."

The bill also authorizes an annual appropriation of $75,000, with an increase of that sum by $10,000 annually for the next five years.

After its introduction, the bill was referred to the Senate Committee on Education and Labor. April 26, that committee reported the bill favorably to the Senate without amendment. The bill now goes to the Senate for action, after which it will go to the House of Representatives. The text of the Senate Committee on Education and Labor report follows:

Calendar No. 1583

76TH CONGRESS *3d Session* — SENATE — REPORT No. 1528

RESEARCH BY PUBLIC HEALTH SERVICE RELATING TO DENTAL DISEASES

APRIL 26 (legislative day, APRIL 24), 1940.—Ordered to be printed

Mr. MURRAY, from the Committee on Education and Labor, submitted the following

REPORT

[To accompany S. 3607]

The Committee on Education and Labor, to whom was referred the bill (S. 3607) to authorize research by the Public Health Service relating to the cause, diagnosis, and treatment of dental diseases, having considered the same, report thereon without amendment and recommend that the bill do pass.

PURPOSE OF THE BILL

This bill purposes to authorize the Surgeon General of the Public Health Service to conduct and direct researches, investigations, experiments, and studies relating to the cause, diagnosis, and treatment of dental disease, to assist and foster similar research activities by other agencies, private and public, and to provide the United States Public Health Service with the necessary funds for carrying out the purposes of this bill.

To this end it authorizes appropriation of $75,000 for the fiscal year ending June 30, 1941, and for the 5 succeeding years, such sum shall be increased $10,000 each year.

PREVALENCE OF DENTAL DISEASES

Dental caries (decay) and the periodontal diseases (pyorrhea) are the two major dental diseases. Only a very small percentage of the population escape the ravages of either or both of these diseases. A study conducted a few years ago by the American Dental Association in collaboration with the United States Public Health Service on over 1,400,000 school children in 26 States showed that more than 90 per cent had one or more decayed teeth. Numerous other dental studies show that the problem of dental caries is of the same order. Owing to the fact that the tooth structure lacks the ability to repair itself as do practically all other tissues of the body, these defects accumulate at an alarming rate with increase in age of the individual.

The Nation-wide dental survey of 1,400,000 school children shows that there is an increase of 33 per cent in the amount of dental decay of the permanent teeth when the 12-14-year-old groups are compared with the 6-8-year-old groups. The figures

have been corroborated by a smaller detailed study made by the Public Health Service in a representative American city of about 30,000 population. This rapid accumulation of dental defects, which the dental profession has been unable to cope with, accounts for the fact a large majority of the adult population of this country have one or more missing teeth.

Dental caries (decay) begins in early childhood and usually continues until most teeth have been affected. Despite the universal incidence of dental caries and its deleterious effects, the causes of dental caries have not been completely established and its general prevention has not been attained. Dental caries is an example of a disease with a high attack rate and for which no adequate control measures have been developed. As a result the 62,000 dentists of the United States have been unable to cope with this problem on the basis of present knowledge of the disease. At least partial methods of control must be developed if we are to escape in the future a toothless civilization.

In the opinion of dental authorities studies relating to cause and prevention of tooth decay are most important since the initial causes of many other serious diseases may follow in the wake of unchecked dental decay.

No more succinct summation of the whole dental decay problem can be found than that recently expressed in a publication of the American Dental Association which stated: "Prevention of the most prevalent of all diseases (dental caries) assuredly deserves special attention from all who aim to conserve the public health and who seek to provide protection against the economic consequences of illness and disability."

PYORRHEA

It is common knowledge that one of the important dental diseases of adult life is pyorrhea. The cause or causes of this disease, as in dental decay, are also wrapped in obscurity. Many who are fortunate enough to save a large number of their teeth by careful attention and adequate treatment lose them later in adult life as the result of the other major disease, pyorrhea, which attacks the supporting structure of the teeth.

The high incidence of this disease in the adult population warrants careful and continuous investigation, second only to decay of the teeth.

Consideration, furthermore, will be given to other dental diseases of less importance than tooth decay and pyorrhea, commensurate with their prevalence and severity.

DENTAL STUDIES BY THE UNITED STATES PUBLIC HEALTH SERVICE

For a number of years and with limited funds and personnel the Public Health Service has been conducting studies of certain aspects of dental disease. The problem of the prevalence of mottled enamel due to small amounts of fluorides in the drinking water was studied by the Public Health Service due [sic] to the fact that this was a problem of national scope. An important by-product of this study indicates that there is a probable relation between the mineral content of domestic water and the amount of dental decay. The work of the Public Health Service in this field has received wide recognition. From limited studies made by the Public Health Service in both dental caries and the periodontal diseases valuable information warranting the most searching inquiry has resulted. The time is ripe to expand these studies with additional funds and personnel in accordance with the provisions of this bill.

SUMMARY

The committee is cognizant that in the past very small amounts of funds have been expended for the investigation of these serious and highly prevalent diseases. It is only fitting that the Federal Government should take the initiative in this work and utilize the splendid facilities and trained investigators of the Public Health Service already operating in the National Institute of Health. They are also in a position to stimulate with small grants-in-aid those public and private institutions which are making worth-while scientific investigations in this field. These diseases are so universal among our citizens that it seems only fit that the Federal Government should take the leadership.

The committee has given much consideration to the question as to the amounts of the authorizations of appropriations and as to the question of a single or continuing authorization. The committee believes that there is no room for reasonable doubt that any attack

on the dental-disease problem must be a very long-range program and that such a long-range program is the very heart of the structure upon which our future methods of the control of these diseases must rest.

The committee is of the opinion that this small annual amount will do much to direct a concentrated attack on a very serious problem affecting many millions of our population.

COMMITTEE ON LEGISLATION

DENTAL PRACTICE ACTS—THE CONSTRUCTION OF DENTURES AS CONSTITUTING THE PRACTICE OF DENTISTRY

MR. Justice Gunn delivered the opinion of the court:

Appellant, James S. Winner, is engaged in the business of making dental plates, under the name of West Dental Factory. He received from Dorothy Kadow, appellee, a judgment note for $25 in payment for a dental plate made for her, and upon non-payment confessed judgment in the municipal court of Chicago. A motion was made to vacate the judgment and an answer was filed charging that the making, furnishing and selling to appellee constituted the practice of dentistry contrary to statute, which made the consideration for said note illegal. The case was tried upon a stipulation of facts. The court held the defense good, vacated the judgment, held the note was void and rendered judgment in favor of the defendant. Appellant has appealed directly to this court on the ground that the constitutionality of section 5 of the Dental Practice act (Ill. Rev. Stat. 1939, chap. 91, par. 60) is involved.

The pleadings and stipulation show that the plaintiff was not a licensed dentist: that on July 31, 1939, and for some time prior thereto, he had been the owner of a dental laboratory making and selling dental plates in Chicago to users who had employed a licensed dentist to take the required impression and fit and adjust the plates. On July 26, 1939, appellee called at the office of Dr. Peterson, a licensed dentist, and employed him to make an impression of her mouth for the purpose of having an upper plate constructed. The dentist took the impression and appellee paid him the fee charged. Appellee then directed appellant to construct such plate from the impressions furnished by the dentist. When it was completed, appellant transmitted it to the dentist at appellee's request. It was fitted by such dentist, taken and used by appellee and has proved satisfactory. It is further stipulated that appellant did not advise, prescribe or tell the defendant anything about the nature or kind of denture required and did not fit the same to the mouth of appellee in any way: that the plaintiff and defendant agreed that the plaintiff would furnish the material and render the services necessary for the construction of the upper plate from the impressions furnished by the dentist for the sum of $25, and that after appellee had been fitted with the completed denture, she signed a judgment note payable to the order of the plaintiff for $25.

Section 5 (paragraph 60) of the Dental Practice act, supra, provides: "A person practices dentistry within the meaning of this act . . . (9) who furnishes, supplies, constructs, reproduces or

repairs, or offers to furnish, supply, construct, reproduce or repair, prosthetic dentures (sometimes known as plates) bridges or other substitutes for natural teeth, to the user or prospective user thereof." The same section further provides: "The following practices, acts and operations however are exempt from the operation of this act: . . . (f) The making and repairing of prosthetic dentures . . . upon order or prescription given by a licensed and registered dentist and constructed on, or by the use of, casts or models made from impressions taken by a licensed and registered dentist: provided such prosthetic or orthodontic appliances, or the services rendered in the construction, repair or alteration thereof, shall not be offered for sale, or use, or delivery to the public. And provided further such prosthetic or orthodontic appliances shall not be placed or adjusted in the oral cavity except by licensed and registered dentist." The violation of law charged by appellee is the making, furnishing and offering to sell and selling to appellee the dentures made in the manner above.

An understanding of what is included and excluded by the statute becomes simpler when we examine the whole act. Paragraph 60, supra, sets forth in ten separate sub-paragraphs matter which constitutes the practice of dentistry, of which the one set forth above is number 9. The same paragraph enumerates six practices including the one above designated "f" which are "exempt from the operation of this act." These practices constitute exceptions to which the remaining parts of the act do not apply. While exceptions in a statute are to be strictly construed, they must be read and applied so as to accomplish the purpose of the law. (People v. Hughes, 370 Ill. 255.) The general purpose disclosed by paragraph 60, supra, is to have dentistry include the making of dental plates and appliances, but still to permit any one not a dentist to manufacture or construct them, if he does not make the cast or model or fit the product in the mouth of the patient, and provided such appliances are made from casts or models furnished by a licensed dentist. With this general purpose of the law in view, the meaning of the proviso that such appliance shall not be offered for sale, use or delivery to the public must be determined.

Statutes must, if possible, be so constructed as to give effect to each word, clause or sentence in order that no such word, clause or sentence may be deemed superfluous or void. (People v. Flynn, 265 Ill. 414: Consumers Co. v. Industrial Com. 364 id. 145.) Likewise, they must be construed so that absurd consequences will be avoided. (Mowequa Coal Corp. v. Industrial Com. 360 Ill. 104: Patterson Pie Co. v. Industrial Com. 335 id. 476.) The legislative intention, when both the exception and the proviso are given effect, is to exempt from the operation of the act the making or repairing of dental plates for that class of persons who have the impressions for the same taken by a licensed dentist and which dental plates, when completed, are fitted by a licensed dentist. When the dental plate is made and fitted in the prescribed manner, it is lawfully subject to sale to the person for whom it was fitted. The sales that are not exempted are the ones where the appliances are not made or fitted in the specified manner and, therefore, the statute prohibited sales to any one except to the person examined or fitted by a dentist. To construe the statute otherwise would produce the absurd and unjust result of permitting appliances to be made upon order, and then forbid the sale to the prospective user or any one else, since the prohibition is broad enough to cover even the dentist who made the cast or fitted the teeth. This is illustrated by In re Chapman, 166 U. S. 661, 41 L. ed. 1154, where the statute punishing a witness for refusal to answer "any question pertinent to the inquiry"

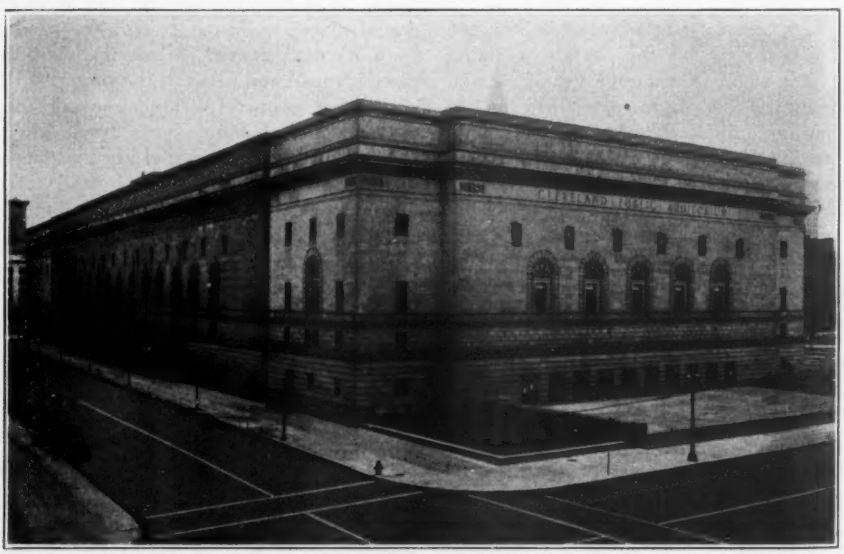
was construed as not all-inclusive but to mean questions within the jurisdiction of the body for proper action, the court saying: "It is true that the reference is to 'any' matter under inquiry, and so on, and it is suggested that this is fatally defective because too broad and unlimited in its extent; but nothing is better settled than that statutes should receive a sensible construction such as will effectuate the legislative intention and, if possible, so as to avoid unjust or absurd construction." See, also, Lanowbew v. United States, 144 U. S. 47, 36 L. ed. 340.

It appears from the stipulation of facts, here, that all the requirements of the statute were complied with, and therefore selling the dental plate to the person ordering it after it had been made and fitted in the manner aforesaid was a dental practice exempt from the operation of the act. Its sale and delivery then constituted a legal and not an illegal consideration.

This construction of the statute renders it unnecessary to determine whether any constitutional rights of appellant have been infringed. However, the decision of the trial court that appellant could not lawfully sell or receive a note in consideration of the sale of such dental appliances did involve the constitutional question raised by appellant which gives this court jurisdiction of the cause on appeal (Bohnert v. Ben Hur Life Ass'n. 362 Ill. 403; People v. Adams, 351 id. 79; Brown v. Federal Life Ins. Co. 353 id. 541) and power to decide the issues, although it is unnecessary to pass upon the validity of the statute.

We are of the opinion that the municipal court erred in rendering judgment for appellee and that, under the stipulation of facts, it should have refused to vacate the judgment. Accordingly, the judgment is reversed and the cause is remanded, with directions to enter judgment for the appellant.

Reversed and remanded, with directions.—James S. Winner v. Dorothy Kadow 373 Illinois 192. December 1939.



Public Auditorium, Cleveland, Ohio.

American Dental Association Eighty-Second Annual Session

CLEVELAND, OHIO, SEPTEMBER 9-13, 1940

CLEVELAND, "genial host to the world," extends a gracious welcome to the American Dental Association, which, between September 9 and 13, 1940, will hold its eighty-second annual convention in the Ohio metropolis on the shores of Lake Erie.

In Cleveland, "the East meets the West and the South," and because it does, a near-record attendance is expected at the September meeting.

Cleveland fathers contend that their city is *the* convention city; that for adequate facilities, it has no equal. One-half of the population of the United States and Canada is within an overnight's train ride of Cleveland. The city is easily reached by air, rail, Great Lakes steamers, motor coach and auto.

Cleveland takes pride in its many comfortable and modern hotels, conveniently grouped. Recreational and amusement opportunities are many. And Cleveland's weather is "most congenial"—thanks to Lake Erie. The American Dental Association is promised a comfortable session next September as lake breezes forestall unseasonable heat waves.

One of the show places of Cleveland is its new $12,000,000 public auditorium, where the scientific sessions will be held and the scientific and commercial exhibits will be on display.

The Cleveland Public Auditorium is one of the wonder buildings of America. It can house sixteen conventions simultaneously, and for beauty, capacity and versatility of arrangements, the auditorium is unsurpassed.

In addition to the great main auditorium, which seats 12,500 persons, there are thirteen halls and meeting places. The Music Hall seats 3,000; the Ball Room, 1,500, and the Little Theater, 700. The auditorium is centrally located and within a few minutes' travel from all the leading hotels.

In brief, Cleveland is a versatile metropolis offering every convenience for a very successful A.D.A. meeting. The downtown area is compact. Shops, offices and stores are conveniently located. Theaters are plentiful. Hotels are known for hospitality and comfortable accommodations. Restaurants, serving fine foods at reasonable prices amid appetizing surroundings, are numerous.

Members of the profession meanwhile will find interest in Cleveland's steel mills, river traffic, roaring airport, residential centers, schools, museums, churches and country clubs.

The city's modern 1,040-acre airport is the largest commercial airport in the world. Other points of interest are: the University Hospitals Group, well-known center of medical schools, libraries and research buildings; the newly laid out Cleveland Mall, a plan for the grouping of pubic buildings; the Lake Front stadium, where 80,000 can be seated for baseball and other sports; the High Level bridge, largest double-decked structure of its kind in the world, and the Cleveland Museum of Art.

Cleveland by night.

American Dental Association

Cleveland, Ohio September 9-13, 1940

HOTEL RESERVATIONS

To secure hotel accommodations for the 1940 Session, consult the rate list below and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 1241, Hotel Statler, Cleveland, Ohio. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

Cleveland, Ohio. September 9-13, 1940

HOTEL.....1st choice

HOTEL.....2nd choice

HOTEL.....3rd choice

Kindly reserve the following: ☐ Single room ☐ Double room ☐ Twin beds.

.....rooms with bath for.....persons $.....per person

.....rooms without bath for.....persons $.....per person

Arriving on September.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL
.....	.....
.....	.....
.....	.....

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make the reservation requested, this application should be forwarded at once to the Housing Committee, Room 1241, Hotel Statler, Cleveland, Ohio.

SCHEDULE OF RATES

ALL ROOMS WITH BATH*

Hotels	Single	Double	Twin	Suites
ALCAZAR HOTEL Surrey & Derberyshire	$3	$5		$12–16
ALLERTON 1802 East 13th Street	2.50–3	4.50	5–5.50	
AUDITORIUM HOTEL E. 6th at St. Clair	2.50–3–3.50–4	4.50–5–5.50	6–7	
BOLTON SQUARE Carnegie at E. 89th St.		5	6	
CARTER HOTEL Prospect near 9th St.	2.75–3–3.50–4	4–5–6–7	6–7–8	12–19
CLEVELAND HOTEL Public Square & Superior St.	3–3.50–4–4.50	4.50–5–6–6.50	6–7–8–9–10	22–30
FENWAY HALL Euclid at University Circle			6–7	10–12
GARFIELD HOTEL Prospect at 38th Street	2.50	3		4–6
HOLLENDEN HOTEL Superior at 6th St.	3–3.50–4–4.50–5–6	5–5.50–6–6.50–7	6–6.50–7–8–10–12	12–40
LAKE SHORE 12506 Edgewater Drive				10–12
MECCA HOTEL 1862 East 9th Street	2	3.50–4		
OLMSTED HOTEL Superior at E. 9th St.	3	6–7	7	9–10–25
REGENT HOTEL 10539 Euclid Avenue		3	5	
STATLER HOTEL (Headquarters) Euclid at 12th	3–3.50–4–4.50–6	5–5.50–6–6.50–7–8	5–5.50–6–6.50–7–7.50–8	10–15
STERLING HOTEL Prospect at E. 30th St.		5	6	
SOVEREIGN 1575 East Boulevard		5–6	8	
STOCKBRIDGE HOTEL 3328 Euclid Avenue	2	3	4	
TUDOR ARMS Carnegie & 107th St.	3–3.50	5.50	6	7–12–20–30
WADE PARK MANOR E. 107th & Park Lane	3.50–4		6	8–10–12–15
WESTLAKE Blount Street	3.50	6		12

*Rates on rooms without bath by request.

ECONOMICS COMMITTEE

ECONOMICS SURVEY OF GREATER CLEVELAND AND NORTHEASTERN OHIO

By CHESTER J. SCHULTZ,* D.D.S., Cleveland, Ohio

QUESTIONNAIRES concerning incomes, fees and other pertinent economic phases of the practice of dentistry were sent to 1,500 dentists in Greater Cleveland and northeastern Ohio, in October 1938. The preparation of the questionnaire and the tabulation of the returns was an undertaking of the Economics Committee of the Cleveland Dental Society. Three hundred and sixty-five questionnaires, or approximately 25 per cent, were returned, completely or partly filled in. Of these, seventy-two were from out of town, as determined from the postmarks (Akron, Mansfield, Willoughby, Painesville, etc.), and 293 from Greater Cleveland. These summaries were tabulated separately and a copy of each summary was sent to every dentist who had received a questionnaire.

A great many interesting facts were brought to light in the tabulation of these returns. It is to be hoped that the number of figures received in round numbers on the question of total gross fees, gross cash receipts and net profit, is indicative of indifference as regards accuracy rather than of failure to keep records. If it is due to a lack of records, a great many men do not know exactly how much money they are making in the profession.

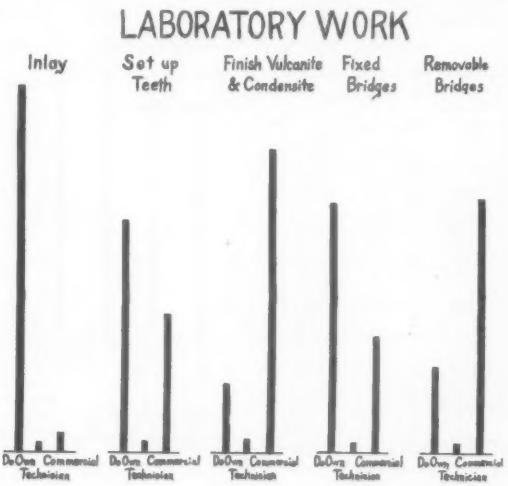


Figure 1.

*Chairman, Economics Committee, Cleveland Dental Society.

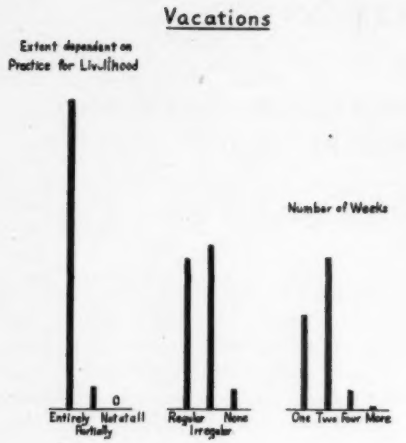


Figure 2.

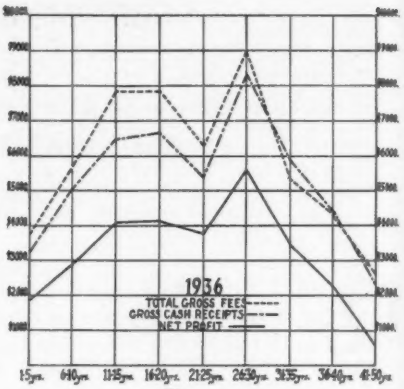


Figure 4.

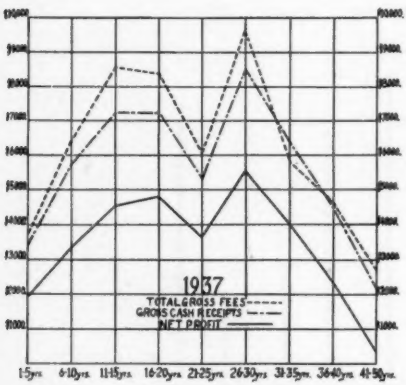


Figure 3.

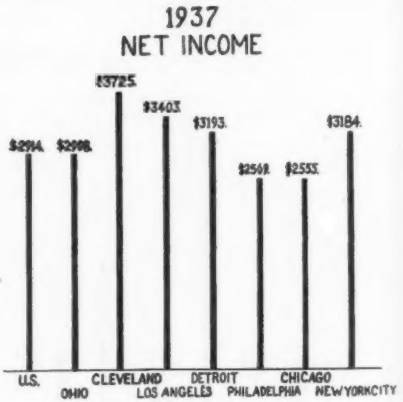


Figure 5.

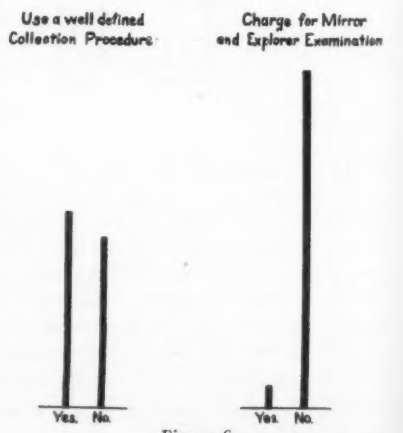


Figure 6.

In a few cases, the returns were obviously intended to deceive in the matter of income and also in the matter of fees, especially some that were so much lower or higher than the average that they were unreasonable. It is probable that these men were doing either very little or no work of the type in question, and therefore did not know what to charge, or that they did not know what it cost to operate their offices.

TABLE 1.—GENERAL INFORMATION

Average	Greater Cleveland	Out of Town
Age of dentist	39.01	41.6
Years in practice	15.35	16.5
Rent per month	$43.09	$32.40
Hours per day in office	7.802	7.62
Evening hours in office	1.916	1.91
Percentage of idle time	30.78	28.5
Rates per hour	$6.076	$5.266

TABLE 2.—INCOME

Average	Greater Cleveland 1936	1937	Out of Town 1936	1937
Total gross fees	$6,298.19	$6,817.70	$5,391.46	$6,626.81
Gross cash receipts	5,580.63	6,116.57	4,795.60	5,564.87
Net profit	3,367.97	3,725.49	3,066.10	3,620.59

TABLE 3.—AVERAGE FEES FOR EXTRACTIONS

Operation	Greater Cleveland	Out of Town
Local anesthesia, single tooth	$2.10	$1.49
Each additional tooth, same anesthetic	1.15	1.02
General anesthesia, single tooth	4.98	5.22
Each additional tooth, same anesthetic	1.10	1.00
Postoperative treatments*	1.04	1.02

*101 men in Cleveland and thirty-one men out of town charge for postoperative treatment.

TABLE 4.—FEES FOR ROENTGENOGRAPHY

Operation	Average Costs Greater Cleveland	Out of Town
Single film	$1.40	$1.43
Bitewing, single film	1.37	1.46
Full mouth*	8.32	8.61
Bitewing, full mouth	5.19	4.35

*The average number of films used in a full mouth examination in Cleveland were 13.02 and out of town, 12.6.

TABLE 5.—AVERAGE FEES (MISCELLANEOUS*)

Operation	Greater Cleveland	Out of Town
Amalgam, 1 surface	$2.37	$1.77
Amalgam, 2 surface	3.52	2.61
Amalgam, 3 surface	5.07	3.70
Gold inlay, 1 surface	8.03	6.91
Gold inlay, 2 surface	11.89	9.98
Gold inlay, 3 surface	15.37	13.32
Gold foil, simple	6.95	5.55
Synthetic porcelain	3.31	2.67
Cement fillings	1.62	1.23
Cement base†	1.10	0.80
Local anesthesia or analgesia‡	1.36	1.02
Prophylaxis, per sitting	2.08	1.84
Treatments, per sitting	1.94	1.46

*Fillings, inlays, anesthetics, prophylaxis and treatments.

†In Cleveland, 165 men charged extra for a cement base and 118 did not. Out of town, forty-nine men charged extra for a cement base and twenty did not.

‡In Cleveland, 150 men charged extra for this operation and 130 did not. Out of town, forty-four men charged extra and twenty-four did not.

TABLE 6.—AVERAGE FEES FOR CROWNS AND BRIDGES

Operation	Greater Cleveland	Out of Town
Porcelain jacket	$30.75	$25.74
Three quarter crown, anterior	15.62	13.16
Cast gold crown	16.96	15.12
Bridgework, soldered backing per tooth	11.08	9.73
Cast backing with porcelain tips	16.12	13.12
Removable bridgework with clasps, per tooth	18.52	14.27
Removable bridgework with attachments, per tooth	27.16	15.65

TABLE 7.—AVERAGE FEES FOR PARTIAL DENTURES

Operation	Greater Cleveland	Out of Town
Vulcanite, with clasps	$50.45	$37.28
Condensite, with clasps	66.87	55.94
Lingual or palatal bar cases		
With vulcanite saddles	61.84	47.39
With condensite saddles	81.48	62.66

TABLE 8.—AVERAGE FEES FOR FULL DENTURES

Operation	Greater Cleveland	Out of Town
Vulcanite, full upper or lower	$41.26	$30.71
Full upper and lower	81.43	60.47
Cellulose material, full upper or lower	55.73	43.40
Full upper and lower	108.19	85.21
Condensite, full upper or lower	65.22	50.59
Full upper and lower	125.58	98.82
Metal base, full upper or lower	112.44	78.75
Full upper and lower	218.99	182.77
Relining full denture, single		
Vulcanite	10.45	9.74
Cellulose	17.35	14.87
Condensite	23.73	16.52
Metal base	34.90	34.00
Duplication of dentures		
Vulcanite	25.03	16.98
Cellulose	32.14	26.98
Condensite	40.83	31.03
Repairs, single tooth		
Vulcanite	2.91	2.50
Cellulose	5.18	4.80
Condensite	6.80	5.65
Repairs, fractures		
Vulcanite	3.52	2.93
Cellulose	7.22	6.25
Condensite	9.52	8.50

TABLE 9.—DATA ON DENTAL EMPLOYES

	Greater Cleveland	Out of Town
Employ an assistant	45%	54%
Employ a dental hygienist	3 dentists	1 dentist
Assistant's weekly salary	$14.38	$12.80

TABLE 10.—INCOME IN RELATION TO YEARS IN PRACTICE

Years in Practice	Total Gross Fees	Gross Cash Receipts	Net Profit
	1937		
1— 5	$3,711	$3,391	$1,933
6—10	6,433	5,661	3,381
11—15	8,565	7,228	4,541
16—20	8,389	7,219	4,816
21—25	6,015	5,298	3,686
26—30	9,659	8,515	5,533
31—35	5,794	6,367	4,029
36—40	4,627	4,517	2,328
41—50	2,644	2,139	373
	1936		
1— 5	$3,725	$3,184	$1,836
6—10	5,693	5,050	2,857
11—15	7,848	6,505	4,066
16—20	7,871	6,662	4,100
21—25	6,306	5,372	3,762
26—30	8,991	8,299	5,626
31—35	5,317	5,881	3,449
36—40	4,314	4,383	2,267
41—50	2,587	2,290	671

TABLE 11.—LABORATORY WORK

	Greater Cleveland		Out of Town	
	Does Own Work	Employs Commercial Laboratory	Does Own Work	Employs Commercial Laboratory
Inlays	268	13	60	2
Setting up teeth	169	101	54	18
Finishing vulcanite and condensite	50	221	23	50
Fixed bridges	182	85	46	19
Removable bridges	62	186	14	58

LIBRARY BUREAU
of the
AMERICAN DENTAL ASSOCIATION
212 E. Superior St., Chicago, Ill.

Books published in 1933-1940
which may be borrowed* or purchased†

Alfred David Lenz System of lost wax casting. New York: National Sculpture Soc., 1933. $2.00.

ALY, BOWER: Socialized medicine: ninth annual debate handbook, 2 vols. Columbia, Mo.: Lucas Bros., 1935. $.75.

AMERICAN ASSN. DENTAL SCHOOLS: Course of study in dentistry. Chicago: Amer. Assn. Dental Schools, 1935. $1. paper, $1.50 cloth.

AMERICAN DENTAL ASSN., COUNCIL ON DENTAL THERAPEUTICS: Accepted dental remedies. Chicago: Amer. Dental Assn., 1935. Also 1937, 1938 and 1939. $1.00 each.

AMERICAN DENTAL ASSN., RESEARCH COMMISSION: Dental caries: findings and conclusions on its causes and control. Chicago: Amer. Dental Assn., 1939. $1.00.

AMERICAN FOUNDATION: American medicine. 2 vols. New York: Amer. Foundation, 1937. $3.50.

AMERICAN MEDICAL ASSN., COUNCIL ON PHARMACY & CHEMISTRY: Glandular physiology and therapy. Chicago: Amer. Med. Assn., 1935. $2.50.

AMERICAN PHARMACEUTICAL ASSN.: Pharmaceutical recipe book. Baltimore, Md.: Amer. Pharm. Assn., 1936. $5.00.

APPLETON, J. L. T., JR.: Bacterial infection with special reference to dental practice. Philadelphia: Lea & Febiger, 1933. $7.00.

ASGIS, A. J.: Outline of dental socio-economics. New York: Allied Dental Council, 1934. $1.00.

BAILEY, HAMILTON: Clinical surgery for dental practitioners. London: Lewis, 1937. $4.00.

BARNHILL, J. F.: Surgical anatomy of the head and neck. Baltimore, Md.: Wood, 1937. $20.00.

BARTLETT, L. W., & NEEL, MILDRED B.: Compensations in the professions. New York: Association Press, 1933. $2.00.

BEUST, T. B.: Dental histology and embryology. Philadelphia: Saunders, 1934. $3.00.

BIRCH, C. L.: Hemophilia—clinical and genetic aspects. Urbana, Ill.: Univ. of Illinois, 1937. $2.00 paper, $2.50 cloth.

BLACK, A. D.: G. V. Black's work on operative dentistry with which his special dental pathology is combined. 4 vols. V. 1—Pathology of hard tissues of teeth; oral diagnosis. V. 2—Technical procedures in making restorations in teeth. V. 3—Treatment of dental caries. V. 4—Diseases and treatment of investing tissues of teeth and other soft tissues of mouth. Chicago: Medico-Dental Pub. Co., 1936. Complete set $16.00, $4.50 per volume.

BLAIR, V. P., & IVY, R. H.: Essentials of oral surgery. St. Louis: Mosby, 1936. $6.50.

BLAYNEY, J. R.: Dental pharmacology and therapeutics. St. Louis: Mosby, 1936. $4.

BLISS, SIDNEY: Introductory guide to biochemistry. Philadelphia: Saunders, 1939. $1.25.

BOGERT, L. J.: Nutrition and physical fitness. Philadelphia: Saunders, 1939. $3.00.

BOYD, J. D.: Nutrition of the infant and child. New York: Natl. Medical Book Co., 1937. $3.00.

BOYLE, H. H.: Principles and practice of applied dental aesthetics. London: Kimpton, 1936. $7.25.

BRAUER, J. C.: Dentistry for children. Philadelphia: Blakiston, 1939. $6.50.

BREGSTEIN, JOSEPH: Dentist and his control of practice. Brooklyn, N. Y.: Dental Items of Interest, 1939. $4.00.

BREMNER, M. D. K.: Story of dentistry—from the dawn of civilization to the pres-

*Books may be borrowed by members of the Association for a period of one week after date of receipt. If they are not reserved for some one else, the period will be extended on request. A deposit of $2 for each volume to be sent at one time should accompany all requests for books. This will be refunded on return of books.

†If you wish to purchase books, indicate plainly which books you desire and enclose check with order.

Junior members may borrow material from the Library Bureau under the same regulations as regular members. As the library facilities are limited, dental students other than junior members cannot be accommodated.

ent. Brooklyn, N .Y.: Dental Items of Interest, 1939. $3.75.

BRIDGES, M. A.: Dietetics for the clinician. Philadelphia: Lea & Febiger, 1935. $10.

BRODERICK, F. W.: Principles of dental medicine: the medical aspects of dental disease. St. Louis: Mosby, 1939. $7.50.

BROWN, G. VAN I.: Surgery of oral and facial diseases. Philadelphia: Lea & Febiger, 1938. $10.00.

BULLEID, ARTHUR: Bacteriology for dental students. St. Louis: Mosby, 1938. $4.75.

BUNTING, R. W.: Oral hygiene and the treatment of parodontal diseases. Philadelphia: Lea & Febiger, 1936. $2.50.

CABOT, HUGH: Doctor's bill. New York: Columbia University Press, 1935. $3.00.

CABRINI, ROMULO: Histologia y embriologia bucodentaria. Buenos Aires, Argentina: Libreria y Editorial "El Ateneo," 1938.

CACERES, EDUARDO: Historia de la odontologia en Guatemala. Guatemala, C. A.: Impreso en la Tipografia Nacional, 1938.

CAMPBELL, A. A.: Dentist's own problem. Portland, Ore.: B-C Publishing Co., 1939. $3.50.

CAMPBELL, HARRY: What is wrong with British diet. London: Heinemann, 1936. $3.25.

CARNEGIE, DALE: How to win friends and influence people. New York: Simon & Schuster, 1937. $1.96.

CHASE, STUART; FAIRCHILD, H. P., & OVERSTREET, A. C.: Rich man, poor man. New York: Harper, 1935. $1.00.

CHILDS, LESLIE: Law for the dentist. Philadelphia: S. S. White, 1934.

CHRISTIE, A. C.: Economic problems of medicine. New York: Macmillan, 1935. $2.00.

CHURCHILL, H. R.: Meyer's normal histology and histogenesis of the human teeth and associated parts. Philadelphia: Lippincott, 1935. $4.50.

CLAPP, G. W.: Dentist faces his future. New York: Dentists' Supply Co., 1939. $1.00.

CLEMENT, F. W.: Nitrous oxide-oxygen anesthesia. Philadelphia: Lea & Febiger, 1939. $4.00.

COMROE, F. I.; COLLINS, L. H., & CRANE, M. P.: Internal medicine in dental practice. Philadelphia: Lea & Febiger, 1938. $4.00.

COOK LABORATORIES: Manual of local anesthesia in general dentistry. New York: Cook Laboratories, Inc., 1936.

COOLIDGE, E. D.: Clinical pathology and treatment of dental pulp and periodontal tissues. Philadelphia: Lea & Febiger, 1939. $6.50.

COURVILLE, C. B.: Untoward effects of nitrous oxide anesthesia. Mountain View, Calif.: Pacific Press Pub. Assn., 1939. $4.75.

COVINGTON, ETHEL: Efficient dental assistant. St. Louis: Mosby, 1940. $2.50.

CRANE, G. W.: Psychology applied. Chicago: Northwestern Univ. Press, 1938. $4.00.

DARLINGTON, C. G.: Yearbook of dentistry, 1936. Chicago: Year Book Pub. Co., 1937. Also 1937, 1938 and 1939. $3.00.

DAVIS, ADELLE: Optimum health. Los Angeles: California Graphic Press, 1935. $2.50.

DAVIS, M. M.: Public medical services: survey of tax-supported medical care in the United States. Chicago: Univ. of Chicago Press, 1937. $1.50.

DAVIS, W. C.: Clinical operative dentistry and therapeutics. Lincoln, Nebr.: Author, 1939. $5.00.

DEWEY, MARTIN, & ANDERSON, G. M.: Practical orthodontia. St. Louis: Mosby, 1935. $8.50.

DEWSON, NELYON J., & DEWSON, J. R.: Charles Nelson Johnson: a tribute. Chicago: Authors, 1940. (Not for sale.)

DIAMOND, MOSES: Dental anatomy: a graphic presentation of tooth forms, with an original technique for their reproduction. New York: Macmillan, 1935. $4.00.

DILLING, W. J., & HALLAM, SAMUEL: Dental materia medica, pharmacology and therapeutics. London: Cassell & Co., 1935. $3.25.

DISRAELI, I.: Vincent's disease, pyorrhea and allied subjects. Los Angeles: Dental Research Pub. Co., 1935. $6.00.

DORRANCE, G. M.: Operative story of cleft palate. Philadelphia: Saunders, 1933. $6.50.

DOUGLAS, P. H.: Social security in the United States. New York: McGraw, 1936. $3.50.

DOXTATER, L. W.: Full and partial denture prosthesis. Brooklyn, N. Y.: Dental Items of Interest, 1936. $6.00.

DUNNING, W. B., & DAVENPORT, S. E.: Dictionary of dental science and art. Philadelphia: Blakiston, 1936. $6.50.

DUTTON, W. F., & LAKE, G. B.: Parenteral therapy. Springfield, Ill.: Thomas, 1936. $7.50.

ENNIS, L. M.: Dental roentgenology. Philadelphia: Lea & Febiger, 1939. $6.50.

EPHRAIM, J. W.: Take care of yourself: a practical guide to health and beauty. New York: Simon & Schuster, 1937. $2.00.

EPSTEIN, ABRAHAM: Insecurity: a challenge to America. New York: Random House, 1936. $4.00.

ESSIG, N. S.: Prosthetic dentistry. Brooklyn, N. Y.: Dental Items of Interest, 1937. $4.00.

FAIRBROTHER, R. W.: Textbook of medical bacteriology. St. Louis: Mosby, 1937. $4.50.

FALK, I. S.: Security against sickness. New York: Doubleday, Doran, 1936. $4.00.

FISCHER, GUIDO: Local anesthesia in dentistry. Philadelphia: Lea & Febiger, 1933. $4.00.

FISH, E. W.: Experimental investigation of enamel, dentine and the dental pulp. London: John Bale, 1933.

FISH, E. W.: Principles of full denture prosthesis. London: John Bale, 1937. $5.00.

FONES, A. C.: Mouth hygiene; a textbook for dental hygienists. Philadelphia: Lea & Febiger, 1934. $5.00.

FRAHM, F. W.: Principles and technics of full denture construction. Brooklyn, N. Y.: Dental Items of Interest, 1934. $7.00.

FÜLÖP-MILLER, RENÉ: Triumph over pain. New York: Bobbs-Merrill, 1938. $3.50.

FURNAS, C. C., & FURNAS, S. M.: Man, bread and destiny: the story of man's food. New York: Reynal & Hitchcock, 1937. $3.00.

GORDON, S. M.: Dental science and dental art. Philadelphia: Lea & Febiger, 1938. $9.50.

GOTTLIEB, BERNHARD, & ORBAN, BALINT: Biology and pathology of the tooth and its supporting mechanism. New York: Macmillan, 1938. $5.00.

GREENFIELD, A. L.: X-ray technic and interpretation of dental roentgenograms. Brooklyn, N. Y.: Dental Items of Interest, 1936. $6.00.

GROSSMAN, L. I.: Root canal therapy. Philadelphia: Lea & Febiger, 1940. $4.00.

HADEN, R. L.: Dental infection and systemic disease. Philadelphia: Lea & Febiger, 1936. $2.50.

HANKE, M. T.: Diet and dental health. Chicago: Univ. of Chicago Press, 1933. $4.00.

HARRIS, L. J.: Vitamins in theory and practice. New York: Macmillan, 1935. $3.00.

HARROW, BENJAMIN, & SHERWIN, C. P.: Textbook of biochemistry. Philadelphia: Saunders, 1935. $6.00.

HAYES, L. V.: Clinical diagnosis of mouth diseases. Brooklyn, N. Y.: Dental Items of Interest, 1935. $7.50.

HERTZLER, A. E.: Surgical pathology of the diseases of the mouth and jaws. Philadelphia: Lippincott, 1938. $5.00.

HESS, A. F.: Collected writings. 2 vols. Springfield, Ill.: Thomas, 1936. $15.00.

HEWER, EVELYN E.: Textbook of histology for medical students. St. Louis: Mosby, 1938. $4.50.

HILDEBRAND, G. Y.: Studies in dental prosthetics. 2 vols. Stockholm, Sweden: Aktiebolaget Fahlcrantz' Boktryckeri, 1937.

HIRSCHFELD, ISADOR: Toothbrush: its use and abuse. Brooklyn, N. Y.: Dental Items of Interest, 1939. $7.50.

HOGEBOOM, F. E.: Practical pedodontia or juvenile operative dentistry and public health dentistry. St. Louis: Mosby, 1938. $6.50.

HOKE, C. M.: Testing precious metals: gold, silver, palladium, platinum; identifying, buying, selling. New York: Jewelers Technical Advice Co., 1935. $1.00.

HOLLIDAY, HOUGHTON: Dental radiology handbook. New York: Macmillan, 1935. $2.00.

HOMANS, JOHN: Textbook of surgery. Springfield, Ill.: Thomas, 1936. $8.00.

HYATT, T. P.: Prophylactic odontotomy: a practical and simple procedure for the prevention of caries in pit and fissure cavities. New York: Macmillan, 1933. $1.50.

INSTITUTE FOR RESEARCH: Career as a dental hygienist. Chicago: Institute for Research, 1939. $1.00.

INSTITUTE FOR RESEARCH: Dentistry as a career. Chicago: Institute for Research, 1939. $1.00.

IVY, R. H., & CURTIS, LAWRENCE: Fractures of the jaws. Philadelphia: Lea & Febiger, 1938. $4.50.

JOHNSEN, JULIA E.: Socialization of medicine. Vol. 10. (Reference Shelf.) New York: Wilson, 1935. $.90.

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OBITUARIES

MAX M. EBLE, D.D.S.
(1865-1940)

KENTUCKY lost one of its untiring workers for organized dentistry in the death of Max M. Eble, on Easter Sunday, March 24, 1940.

Born at Fulda, Ind., April 12, 1865, he graduated from the Tell City, Ind., High School in 1887 and received his D.D.S. degree in 1892 from the University of Cincinnati, Department of Dentistry. He practiced his profession in Rio de Janeiro, Brazil, for three years before locating in Louisville, Ky., and was soon after this enrolled on the faculty of the Louisville College of Dentistry. He taught for nearly twenty-five years, his subjects being history and ethics.

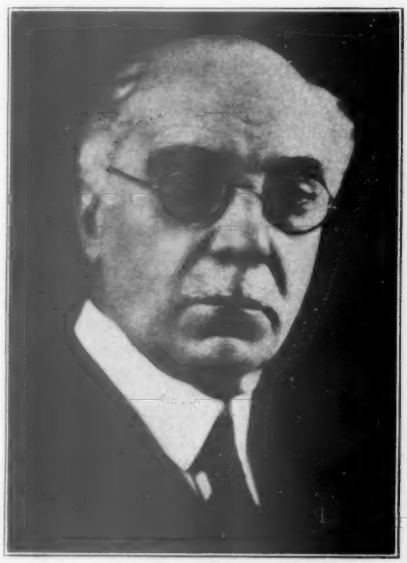
Always an active member of organized dentistry, he was honored by election as president of the Kentucky State Dental Association and of the Louisville Dental Society. He was a charter member of the Louisville Odontological Society, which is now the Louisville Philological Society. When the American Dental Association was organized in the present form, he was on the committee that divided the state into its component societies and helped to organize them. He also served on the Kentucky State Board of Dental Examiners for a number of years.

His lovable disposition, his gift of oratory, and his untiring zeal for the advancement of his profession endeared him to all, and his place will be hard to fill in the minds and hearts of the dentists of Louisville and Kentucky.

JOHN HOWARD REED, D.D.S., M.D.S.
(1859-1940)

JOHN HOWARD REED, D.D.S., M.D.S., died at his home in Bronxville, N. Y., March 12, 1940, in his eighty-first year. He had retired from active professional work in 1937, having been continuously in dental practice in New York, N. Y., for fifty-six years.

Born in Bond Street, near the Bowery, in New York, April 8, 1859, Dr. Reed received his early education in Grammar School 35 of that city. He graduated from the New York College of Dentistry (now New York University) in 1881. Dr. Reed came of medical stock, his father, the late James A. Reed, having been surgeon of the 69th Regiment S. N. Y., from 1861 to 1864. His mother, Matilda V. Seacord, born in New Rochelle, N. Y., traced her ancestry to Rochelle, France.



John Howard Reed

Early in his career, Dr. Reed became interested in advancing the standards of dental education. Among the conspicuous practitioners and educators of that day with whom Dr. Reed consulted and who took an active interest in his proposals were William H. Atkinson, E. A. Bogue, William Carr, William C. Deane, J. N. Farrar, John I. Hart, W. E. Hoag, Alfred R. Starr, Benjamin C. Nash, Arthur L. Swift, Zachary T.

Sailer and Benjamin Lord. In 1892, Dr. Reed secured a charter from the regents of the State of New York for the New York Dental School, which opened its doors for students in September 1893, in the then newly erected Kennedy Building at 22nd Street and Fourth Avenue. The institution offered a four-year course in dentistry, for men and women, the entrance requirements being similar to those of the dental schools of Ann Arbor and Harvard universities. It was Dr. Reed's hope and purpose that the school should one day become a part of Columbia University.

Ill health from overwork forced Dr. Reed to relinquish the office of secretary and the active control of the school in 1895. John I. Hart, a close friend having wide influence in dental affairs at that time, assumed executive responsibility until 1905, when William Carr became dean, and the name of the school was changed to the College of Dental and Oral Surgery of New York. In 1923, the college was merged with the newly organized dental school at Columbia, the name again being changed to the School of Dental and Oral Surgery of Columbia University. In recent years, Dr. Reed had been elected an honorary dental alumnus of Columbia.

A modest and unassuming gentleman, Dr. Reed nevertheless took an important part and exerted a continuing influence in the history of dental education in New York City for a period of many years. Largely through his efforts, the low standards of instruction in the private-corporation schools of that day were advanced.

Dr. Reed was a member of the First District Dental Society, S. N. Y., the Dental Society of the State of New York and the American Dental Association. He was past president of the Alumni Association of the New York College of Dentistry.

Dr. Reed married Miss Sophia Dall Compton, of Plainfield, N. J., who survives with one son, James Howard Reed, D.M.D., New York, N. Y., and a granddaughter, Laura Patricia Reed.

WILLIAM B. DUNNING.

DEATHS

BAKER, CHARLES R., Davenport, Iowa; University of Pennsylvania School of Dentistry, 1883; died March 7; aged 81.

BERGQUIST, ALBERT A., Sioux City, Iowa; Northwestern University Dental School, 1909; died March 11; aged 53.

BUELL, HARRY S., Detroit, Mich.; University of Michigan, School of Dentistry, 1896; died March 30; aged 67.

DAINS, FRED W., Willisville, Ill.; St. Louis University School of Dentistry, 1914; died February 11; aged 52.

DILLER, SAMUEL W., JR., Lancaster, Pa.; University of Pittsburgh, School of Dentistry, 1918; died March 28; aged 45.

FINEMAN, JOSEPH J., Detroit, Mich.; University of Michigan, School of Dentistry; died February 23; aged 35.

FRAZIER, WILLIAM N., Brooklyn, N. Y.; died April 19.

GIER, RICHARD H., Adrian, Mich.; University of Michigan, School of Dentistry, 1923; died March 1.

GOODRICH, LEON H., Norman, Okla.; Western Dental College, 1906; died January 1.

HACKETT, JOHN V., Chicago, Ill.; Kansas City Dental College, 1901; died March 4.

HIGGINS, WILLIAM J., Traverse City, Mich.; University of Michigan, School of Dentistry, 1894; died March 10; aged 66.

HORTON, PHINEAS E., Winston-Salem, N. C.; Baltimore College of Dental Surgery, 1894; died April 14; aged 67.

HOWES, R. N., JR., Clinton, Iowa; State University of Iowa, College of Dentistry, 1916; died March 18; aged 46.

KEIM, CHARLES F., Harrisburg, Pa.; University of Pennsylvania, School of Dentistry, 1893; died April 24; aged 73.

MCCLOSKY, EUGENE A., Mahanoy City, Pa.; University of Pennsylvania, School of Dentistry, 1917; died recently.

MCKIBBIN, GEORGE PAUL, Mount Pleasant, Iowa; State University of Iowa, College of Dentistry, 1904; died February 2; aged 58.

MILBOURN, REASON E., North Baltimore, Ohio; Vanderbilt University School of Dentistry, 1894; died February 4; aged 75.

PRACTICE IN PARAGRAPHS

Protecting Silicates—Ordinary 2, 5 and 10 grain drug capsules are most useful when class 2, 3 and 5 synthetic fillings and full crowns are to be inserted. These capsules have two advantages: keeping the tooth dry and keeping the pressure on the material while the setting is in progress. The saliva should be kept from the capsule until the material is completely set. Coating the capsule with a thin layer of amyl acetate will render the capsule less soluble.—*Calvin William Knowles, M.D., D.D.S., 177 Post St., San Francisco, Calif.*

Better Oral Visual Clarity with Less Eyestrain—With due deference to dental manufacturers, I find the surgical head lamp the most useful and indispensable light in dentistry. I advocate its use in conjunction with the everyday operative lamps, for all dental procedures. I have tried nearly all modern lamps on the market, and have found that the surgical head lamp, containing a 10-watt bulb, used in conjunction with the ordinary operative lamp, will improve visual oral clarity at times up to 70 per cent. I do not hesitate to say that of all dentists who will use it for a period of ten days, 80 per cent will thereafter continue to use it routinely.—*Sigmund F. Faye, 2348 S. Seventh St., Philadelphia, Pa.*

Removing Celluloid Form and Silicate—Wherever there is need for a celluloid form for esthetic purposes, the following procedure will avoid the difficulties encountered in removing both form and silicate from the prepared cavity. After the celluloid form is trimmed to fit the tooth, a layer of the correct shade of silicate is placed on the labial, mesial and distal surfaces of the form, and allowed to harden. Softened gutta-percha is then inserted in the form and placed on the tooth. Not only will this procedure facilitate removal, but it will also keep the gingiva from growing over the shoulder of a tooth prepared for a porcelain jacket crown.—*Michael I. Kalman, 5520 Fifteenth Ave., Brooklyn, N. Y.*

Cellophane—There are two kinds of cellophane. The first is water-proof and does not soften when wet, but is not resistant to organic solvents, such as methyl methacrylate. It is used for wrapping foods, to prevent drying out. The second type is not water-proof and softens readily when wet, but is resistant to organic solvents. This is the type that is intended for ornamental purposes and gift wrapping. It is the second type that should be used for test-packing acrylic resins.—*Alfred T. King, 185 N. Wabash Ave., Chicago, Ill.*

Removal of Superficial Bone Spicules—In edentulous cases, during the process of resorption, underlying bits of bone can be removed conveniently through a short incision below the protruding bone and parallel to the ridge. One side of the flap is pushed back and the pointed tissue is trimmed with a sterile enamel cleaver and smoothed with a clean operative file. The wound is washed with warm water to promote bleeding and swabbed with an astringent, and the incised gum tissue allowed to slide back in place. Free bleeding, with only superficial anesthesia, results in the most rapid healing, while large incisions and the use of bone trimming forceps in such cases causes only increased irritation, slower healing and the possibility of "wound-gaping" and sequestra formation due to exposure of bone in contact with mouth secretions.—*G. Sidney Jacks, 4125 W. Montrose Ave., Chicago, Ill.*

INCIDENTS OF PRACTICE

Significance of the Bismuth Line in the Mouth

By JAMES T. SWEENEY,* Stockton, Calif.

As a study of the significance of the bismuth line reveals facts that may be of interest to the general practitioner, I shall outline some of the observations made on the problem at the Stockton State Hospital.

The problem presented itself as follows:

1. Does a bismuth line in the mouth indicate a toxic concentration of the metal?

2. If so, is the bismuth responsible for the gingivitis?

3. If the bismuth line *per se* did not necessarily indicate overdosage, did it appear as a result of a preexisting gingivitis?

The mouths of 100 syphilitic patients were examined prior to the introduction of bismuth medication. Areas of gingival inflammation were charted, special reference being made to chronic infection of the entire gingivae, localized areas where the inflammation was probably caused by irritation from overhanging crowns or fillings and those mouths where no gingival inflammation was present at all.

The results of the survey showed that:

1. A bismuth line appeared in the mouth in an area of a preexisting gingivitis.

2. Occasionally, a bismuth line did not appear even though the gingiva was generally infected.

3. There were localized areas of bismuth pigmentation in otherwise healthy mouths in inflamed areas around ill-fitting dental prostheses.

4. At no time did the bismuth line appear where the gingiva was healthy before medication was instituted.

The observations as outlined lead us to believe that the gingivae must be infected before the bismuth is deposited, but all infected areas will not develop a bismuth line. A fact of special interest was observed in the mouths of a few patients in that one or more inflamed areas were present, whereas the general mouth conditions were healthy. In some cases, all inflamed areas were involved, while, in other mouths, certain areas were selected for pigmentation, the remaining areas of inflammation not becoming discolored.

We have concluded that the bismuth line is not a manifestation of serious systemic toxicity, but it should not be ignored. While withdrawal of medication may be in order for a given patient, it is a matter which should be determined according to the clinical judgment of the individual response. Therefore the bismuth is not, in our opinion, the cause of the stomatitis with which it is associated.

*Resident dental surgeon, Stockton State Hospital.

Should Non-Vital Infected Teeth Be Removed?

By JOSEPH KUSSY, Ph.G., D.D.S., Newark, N. J.

WITH the difference of opinions existing relative to the far-reaching effect of certain oral foci of infection, the case herein presented is noteworthy.

A boy, aged 12, awoke early one morning about a year ago with a badly swollen sore toe and much pain. His parents, fearing he had bruised it by kicking something hard, took him to a physician, who advised bath-

ing the part in a hot saline solution. There was no improvement. After several visits, roentgenograms of the foot were taken, which proved negative as far as the bone structure was concerned.

The boy was then referred to a well-known internist, who diagnosed the case as one of epiphysitis. The foot and leg were put in a cast, October 31, 1939, and this was worn for six weeks. During this time, sulfanilamide was administered. There was no change in the condition. The patient walked only with the aid of crutches for the next ten weeks.

He was referred to this office for a check-up of his teeth, December 23. It should be noted here that there was no history of trauma nor was there any evidence of systemic infection. It should also be noted that, for some time after the onset of the condition, the boy had been tested and treated for an allergy, with no results.

A roentgenogram revealed an infected upper left first molar, which was immediately removed. Two days later, on Christmas Day, the boy's mother reported that she had received the "finest Christmas present ever," that the patient had his shoes on and was running around "like a regular boy." She said further, "He expects to attend classes in school on January 3."

Later the case was discussed with several eminent pathologists and internists, and it was agreed that, although most unusual to say the least, the change was possible.

In any case, the facts are these and they can be readily substantiated by all parties concerned.

88 Clinton Avenue.

Fractured Central Incisor

By K. R. DURHAM, D.D.S., Tahoka, Texas.

A man, aged 32, had received a blow on the central incisor fourteen years previously. The tooth was knocked loose by the blow and was fractured, as the x-ray film shows, but recovered from the blow and for fourteen years was normal. The tooth was vital according to an electric pulp test.

At the time of extraction, a lingual pocket had developed, and the tooth was extracted for that reason. I now believe that the tooth could have been left in.

Three Sets of Erupting Upper Central Incisors

By M. H. BERNARDS, D.D.S., Chicago, Ill.

FOLLOWING is a report of a case of three sets of erupting upper central incisors.

A BOY, aged 6 years, the youngest in the family and born late in the life of his parents, was brought to the office about three months ago for extraction of two very loose upper deciduous central incisors. After the extraction, the patient was dismissed with instructions for postoperative care. Recently, the mother brought the boy to the office because

of the appearance of two conical upper central incisors, which had erupted after the first extraction. A roentgenogram taken immediately showed that this was another set of deciduous central incisors. The second set was extracted under nitrous oxide anesthesia and it is hoped that the last, and this time permanent, set of upper central incisors will finally erupt.

3934 West North Avenue.

Impacted and Supernumerary Teeth with Cyst: Report of a Case

By S. L. ELLIOTT, D.D.S., Osakis, Minn.

A BOY, aged 17, was sent to me by a physician as he was having trouble breathing, in addition to being very rheumatic. Examination revealed six impacted teeth, three supernumerary teeth and a large cyst. (Figs. 1-2.)

An operation was performed under local anesthesia and the nine teeth and the cyst were removed at one sitting through a large opening in the maxillary antrum, the antrum being left alone, with a single flap sutured in position.

Figure 1.

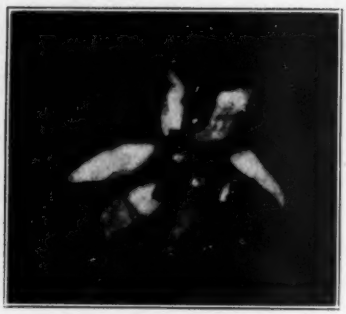


Figure 2.

The nose condition cleared up without incident, and the rheumatic condition has not returned in three years.

Broken Instrument in the Jaw

By A. D. BARBER, D.D.S., Ogden, Utah.

IN a practice of more than thirty years, the case I herewith submit is, I believe, the strangest.

About three years ago, I employed a bilateral Akers appliance to replace the lower first and second molars on each side and the left second bicuspid. After a few weeks, the patient returned, saying the saddle on the left side hurt whenever she tried to chew on that side. As there was one particular spot that was noticeably sensitive to pressure, I relieved the saddle area a little, and everything went well for a few weeks, when I had to further relieve the pressure.

About every three months, I had to give relief. Finally, a little more than a year ago, I took an x-ray picture and, on examining the picture carefully, discovered what I thought to be a screw in the jaw. On the next visit, the patient, after some questioning, recalled that about twenty-five years previously she had had a molar extracted in Oklahoma. She said: "The dentist had a terrible time. He dug and dug to get the roots out. He took an instrument that looked like a big screw with a handle on it, and he dug with that, and I told him he had broken it off in my jaw, but he said that he hadn't. My jaw was sore for some time after that."

Screw in jaw.

She asked me what could be done about it, and I said that it should be removed surgically, but she would not consider it. A year later, she was in my office and I asked her if the saddle had bothered her any more, and she said that it had not, "since I know what it is." She says that she wears the denture all the time, and I have every reason to believe that the screw is still in her jaw.

Suppurating Dentigerous Cyst

By O. J. SHAFFER, D.D.S., El Paso, Texas.

History.—A woman, of Mexican-Indian extraction, aged 64 years, came to the dental clinic complaining of pain and a discharge

of pus from the crest of the ridge in the bicuspid area of the right mandible. Clinical examination showed the mouth to be edentulous, except for one partially erupted tooth in the incisal area of the mandible, and a fully erupted upper central incisor. The mandible was enormous as compared with the upper part of the face and head. The patient's weight was 120 pounds. Her general health was good and she had never been sick except for minor ailments. As well as she could remember, she had had a full set of deciduous teeth, which, to use her own words, "Se le cayeron cuando estaba chica, y estos no le volverion a salir" (fell out when a very small girl, these two; no more come).

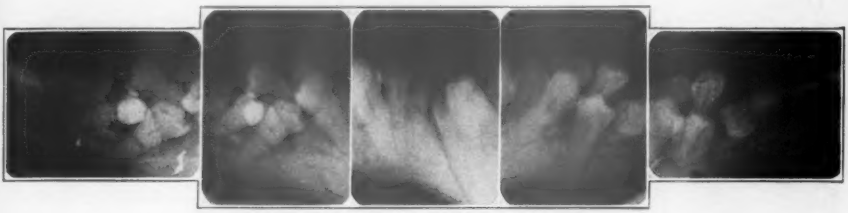


Figure 1.

Diagnosis.—The accompanying roentgenograms revealed the cause of the pain and pus discharge, and the condition was diagnosed as "suppurating dentigerous cyst."

Operation.—Under conduction anesthesia, two cuspids and fifteen bicuspids were removed, along with cystic tissue. The usual postoperative care was given. The patient was dismissed from hospital with instructions to return for removal of the teeth in the upper jaw, but as yet has not been heard from.

Comment.—As was stated, the only tooth showing was a central incisor. A lateral jaw roentgenogram obtained from a dentist in Hot Springs, New Mexico, showed this tooth to have no root. There was a fully developed impacted cuspid directly above it, and what seemed to be an inverted cuspid, one-half normal size, impacted palatally from it. No other teeth were present.

As there was no thought of reporting the case, dental roentgenograms were not taken of the upper jaw because no operation was to be performed at that time, and the extra-oral 5 by 7 film furnished the information needed. Figures 1 and 2 show the enormously enlarged mandible, as compared with the maxillae and also the maxillary teeth present.

Figure 2.

First National Building.

Tooth Fusion

By RALPH CHERNIAK, D.M.D., South Boston, Mass.

THE accompanying roentgenogram shows a case in which the second and third molars were fused together. The size of the tooth prompted me to roentgenograph it.

394 West Broadway.

A Migrating Mandibular Bicuspid

By FRED C. NERISH, D.D.S., Cincinnati, Ohio.

JULY 3, 1914, on examination of M. S., a girl, aged 13, a roentgenographic plate (Fig. 1) disclosed an unerupted lower left second bicuspid. The patient was advised to have her teeth straightened, but, because of her poor physical condition, the advice was not taken.

Figure 1.

Figure 2.

Roentgenograms made March 12, 1922 (Fig. 2) show the bicuspid to be turned at right angles to its former position, with the crown pointing distally. Root formation is complete.

Roentgenograms made October 30, 1930, November 2, 1932 and October 1, 1939 (Fig. 3) show the crown of the bicuspid to be in the region of the third molar. In the belief that the tooth might continue its migration distally, the third molar was extracted, in order to allow the unerupted tooth to advance into the position formerly occupied by the roots of the third molar, thereby making possible the extraction of the bicuspid without injury to the remaining teeth. However, the tooth failed to advance any farther and had been allowed to remain *in situ*. During the last nine years, no appreciable change in position has taken place.

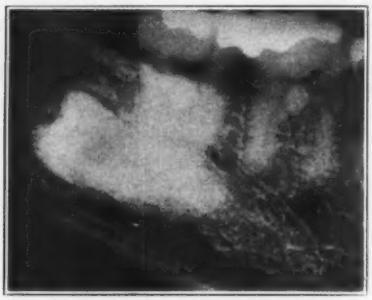


Figure 3.

Throughout the twenty-five years during which this patient has been observed, the occlusion of the teeth has remained unchanged. Furthermore, she has had no symptoms of neuralgia or other complaints of dental origin.

1981 State Avenue.

CURRENT LITERATURE

Experimental Dental Caries. IV. Fluorine and Its Relation to Dental Caries

By GERALD J. COX, MARGARET C. MATUSCHAK, SARA F. DIXON, MARY L. DODDS and W. E. WALKER

THE literature relating to the study of endemic mottled teeth is aptly reviewed, as well as more recent theories relevant to caries inhibition by fluorine. The present authors offer in this paper more concrete evidence than was presented in earlier notes that fluorine has a beneficial rôle in the formation of caries-resistant teeth. Beginning with pregnancy, fluorine was fed as sodium fluoride with caries-producing diets. Differences between amounts of fluorine fed and caries incidence were evaluated by means of the frequency of "occlusal" and "fissure" caries.

Correlation of caries incidence in human beings in fluorine endemic areas has been criticized because of the widely different composition of the mineral content of the drinking waters of the communities. Experimental evidence offered by these authors is proof that fluorine alone plays a part in reducing caries incidence by its presence during the formation of the teeth.—*J. D. Res.*, **18**:481, December 1939.

VIRGIL D. CHEYNE.

Effects of Natural and Refined Sugars on Oral Lactobacilli and Caries Among Primitive Eskimos

By DONALD B. WAUGH and LEUMAN M. WAUGH

IN this study, the primitive and semicivilized natives of the Kuskokwim River area in Alaska were observed. Previous data on these people have shown that the primitive diet is practically free from fermentable carbohydrates and the incidence of caries is low. An attempt was made to compare the amount of caries produced in a relatively caries-free population by feeding of natural and refined sugars over an average of five and one-half weeks. Nearly 100 per cent of those free from caries in the group fed natural sugars remained free from caries and showed a drop in percentage of lactobacilli. A small increase (1.57 cavities) was noted in the group with active caries. Of those free from dental caries in the group fed refined sugars, 72.73 per cent showed inception of caries, with an average of 3.6 cavities. A large increase (4.9 cavities) was noted in the group with active caries. In the group fed refined sugar, 81.90 per cent showed initiation of growth of oral lactobacilli, the organism being present in 100 per cent of mouths at the end of the period. From these figures, one may conclude that, with the Eskimo, refined sugars initiate and cause an increase in the growth of oral lactobacilli and that they initiate and cause an increase in dental caries.—*Am. J. Dis. Child.*, 59:483, March 1940.

VIRGIL D. CHEYNE.

Etiology and Treatment of Seventh Nerve Paralysis

By C. H. MCCASKEY

ETIOLOGIC factors entering into facial paralysis are listed as follows in the order of importance: (1) trauma, (2) infection, (3) exposure, (4) neoplasm, (5) general systemic disease, (6) toxicosis and (7) allergy.

Trauma may be due to injury to the nucleus by contusion, laceration, stricture, edema, the presence of a hematoma and skull fracture. Section of the nerve may occur during mastoidectomy and operation on the auditory nerve, petrous apex, etc. Differential symptomatology is discussed when injury has occurred at various points along the nerve. The infection may be brain abscess, meningitis or acute suppurative otitis media. The symptomatology is also discussed. Exposure to a chilling draft over an extended period of time causes an inflammatory change in the geniculoforaminal subdivision close to its exit from the stylomastoid foramen. Neoplasms may involve any division of the nerve and may be benign or malignant.

The therapeutic treatment may be nonsurgical; i.e., medical or physicotherapeutic. Surgical treatment may be intracranial or plastic or an anastomosis of the seventh nerves with other nerves, and decompression.—*Ann. Otol., Rhin. & Laryng.*, 49:199, March 1940.

N. S. SIMMONS.

Artificial Caries Produced by Streptococcus Viridans

By CAROLYN HAMMOND and RUTH TUNNICLIFF

SIXTEEN sterilized teeth, partially covered with wax, were incubated in glucose broth inoculated with a culture of *Streptococcus viridans* isolated from carious dentin. The broth was changed weekly. After fourteen days, enamel decalcification was noted and, in teeth incubated for more than three months, streptococci showing pleomorphic bacillary and filamentous forms were observed in the dentinal tubules when studied in celloidin sections. After three months, controls kept in broth at pH 4 showed enamel decalcification, but not destruction of the dentinal tubules. Controls inoculated with *B. coli* decalcified the enamel and invaded the tubules.—*J. D. Res.*, 19:1, February 1940.

B. G. BIBBY.

Dental Anesthesia in Children. A Comparison of Vinyl Ether and Ethyl Chloride in a Series of 200 Cases

By J. O. FRENCH, M. L. HOOKER, R. B. VANSE and A. L. ROBINSON

IN 200 anesthesias for dental extraction, vinyl ether and ethyl chloride were each used 100 times. Tabulations are given of age distribution, general systemic manifestations, the features of the induction period and periods of effective anesthesia. It is concluded that these anesthetics are safe and useful. Vinyl ether was found to have the shorter and less certain action. It was more apt to cause struggling during induction (owing to the unpleasant odor) and troublesome salivation. There was a shorter recovery period and less likelihood of vomiting. Ethyl chloride anesthesia sometimes caused rigidity of the jaws.—*Brit. M. J.*, 1:432, March 1940.

B. G. BIBBY.

Double Elongations of Partially Cleft Palates and Elongations of Palates with Complete Clefts

By J. B. BROWN

NEARLY all the soft tissue of the palate is freed from the bone without severing the major palatine arteries and the entire mass of tissue is immediately set back. The cleft may or may not be closed at the same operation. A two-stage operation is advisable in adults. When only a narrow ledge of bone is present, lingually from the alveolus, a "double elongation" is performed. This is essentially a two-stage operation wherein the first is repeated after healing.

Results of closure of the cleft and elongation are encouraging, according to the author. The bone is covered over in about thirty days; speech improvement is almost dramatic in many cases, and eating is facilitated. Details of the operations are given.—*Surg. Gynec. & Obst.*, 70:815, April 1940.

MARTIN DEAKINS.

Histological Evidence of the Harmful Effect of Cement Under Orthodontic Bands

By WILLIAM LEFKOWITZ

ORTHODONTIC bands were placed on eighteen human adult teeth *in situ* with cements containing phosphoric acid. After seven days, the teeth were extracted, sectioned and examined for surface defects by simple inspection and the use of grenz rays and dyes. In fifteen of the eighteen cases, white spots appeared on the surface of the enamel, which showed decalcification in grenz-ray pictures, and which was readily stained with the dyes. It was concluded that dental cement decalcifies enamel. Why there are localized areas of decalcification beneath the bands is not known.—*J. D. Res.*, 19:46, February 1940.

MARTIN DEAKINS.

Surgical Treatment of Cancer of the Tongue

By LELAND R. COWAN

THE author presents a good synopsis of the various surgical treatments of cancer of the tongue, prevention of carcinoma of the tongue and location of these tumors on the tongue.

One must always be on the alert for the

many possibilities in tongue cancer because of the frequency of metastasis unilaterally, bilaterally and contralaterally.

Operative intervention is always indicated in all lingual precancerous and suspected early cancerous lesions. The entire lesion should be removed. In general, surgery is an adjunct to irradiation for the treatment of tongue lesions.

Bilateral block dissection of the neck may be advisable in carefully selected cases, but is not indicated in the absence of metastases. Incomplete block dissections are responsible for many failures that might otherwise be successes in the hands of one trained in the practice rather than the mere theory of this type of major surgery.—*Surg., Gyn. & Obst.*, 70:543, February 1940.

ARTHUR F. FISHER.

Effect of Fluorine on Solubility of Enamel and Dentin

By JOSEPH VOLKER

SAMPLES of powdered enamel and dentin were allowed to come in contact with a fluoride-containing solution of varying concentrations. After the excess of fluoride had been removed with repeated washings, the solubility of the treated tooth substance in a buffered acetic acid solution with a pH of 4.0 was determined by a gravimetric technic. It was found that enamel and dentin subjected to this treatment showed a marked decrease in acid solubility. The change in solubility is probably the result of adsorption of fluoride on the tooth particle surface. It is suggested that the decreased caries incidence of the upper incisor teeth of those peoples living in areas where the drinking water has a high fluoride content is the result of the adsorption of fluoride on the enamel surface.—*Proc. Soc. Exper. Biol. & Med.*, 42:725, December 1939.

JOSEPH VOLKER.

Importance of a Detailed Clinical Examination of Carious Lesions

By REIDAR F. SOGNNAES

IN examining the teeth of thirty-two children 4 to 13 years old, the efficiency of various diagnostic procedures has been studied in an attempt to determine what types of lesions are most liable to be overlooked. Nearly all carious cavities could be disclosed by the use of mirror and explorer except for the smaller proximal cavities, which were disclosed by roentgenograms. The initial stages of smooth-surface lesions could be properly examined only after cleaning and drying of the teeth. By that procedure, these lesions were proved to comprise 20 per cent of the total number found in the examined teeth. The term "precaries" is suggested for the first stage of such smooth-surface lesions (i.e., before any roughness or cavity formation is detectable) and their practical and theoretical importance is emphasized.—*J. D. Res.*, 19:11, February 1940.

VIRGIL D. CHEYNE.

Roentgen Therapy of Bilateral Parotid Fistula

By ROBERT J. REEVES

UNILATERAL salivary fistulae are not uncommon, but bilateral fistulae as a surgical complication are considered quite rare.

Barbera made a study of several operations for excessive salivary secretion and concluded that suppression of salivary secretions was best produced by high voltage roentgen irradiation. He found that salivary secretion was controlled from the first treatment. After the third and last treatment, it was definitely suppressed. A fistula was found to heal in from two to three days after completion of the treatment.

The author presents a case similar to that of Barbera, except that it required more treatments, possibly owing to the fact that a shorter wave length was used. A complete report is given of the case of a 13-year-old girl who underwent satisfactory treatment for bilateral fistulae of eight years' duration.—*Am. J. Roentgenol.*, 43:425, March 1940.

ARTHUR F. FISHER.

Om Ekstraksjon Av 6-Aars Molarene I Skolealderen (Extraction of the First Permanent Molar During Childhood)

By GUTTORM TOVERUD

THE author has studied the possibilities of extraction of the first permanent molars as a satisfactory treatment in cases when one cannot meet the extensive needs of operative treatment of these teeth.

Such extractions have been carried out at different ages and the results studied clinically and by means of models and x-ray

films until completion of the dentition. According to the results, such therapy has the greatest advantage when employed at the age of 10, the teeth in the meantime being treated by temporary procedures only.

Extraction at this age has proved to be of relatively little disadvantage as regards growth and efficiency of the jaws. Furthermore, the extraction openings close fairly early; the prognosis for the eruption of the third molars is improved, and a good caries-prophylactic effect is obtained for the remaining teeth. If the first permanent molars have been removed at the age of 10, the remaining teeth attain a very satisfactory position and occlusion by the age of 21. It is also clear from the illustrations that any negative criticism as to the results before the eruption of the third molars would be wholly unjustified.—*Norske Tannl. Tid.*, **50**:28, January 1940.

R. F. SOGNNAES.

Keratinization of the Human Oral Mucosa

By JOSEPH WEINMANN

THE author presents a technic for obtaining and staining smears from various regions of the oral mucosa. By his method, the smears are unfixed, and observation of each cell separately is thus permitted. He found six stages in the keratinization process of oral epithelium, the degree of keratinization being lowest in the cheek smears and increasing progressively in smears from the tongue, gums and palate.

The number of leukocytes decreased as keratinization increased; which led to the conclusion that the migrant leukocytes take over the protection of mucous membrane when the latter is not protected by a keratinized layer.—*J. D. Res.*, **19**:57, February 1940.

B. P. KEARNEY.

Observations on the Amount of Ascorbic Acid Required to Maintain Tissue Saturation in Normal Adults

By E. NEIGE TODHUNTER and RUTH C. ROBBINS

PLASMA ascorbic acid and urinary excretion studies were made on three female subjects to determine the minimum intake of ascorbic acid necessary to maintain the tissues at saturation with respect to the vitamin. The findings of saturation values of from 1.3 to 1.8 mg. ascorbic acid per hundred cubic centimeters of blood plasma is in agreement with previous reports. The saturation point was determined by maintaining the subjects on a basal diet and supplement containing 40, 70, 90, 100 and 200 mg. of ascorbic acid for six days, watching the rise in plasma values and then giving a test dose of 400 mg. and watching for a rise. Saturation was taken to be the value at which a test dose produced no immediate rise.

Saturation was maintained on a daily intake of 1.6-1.7 mg. ascorbic acid per kilogram of body weight. Blood values above 1 mg. per hundred cubic centimeters were obtained on a daily intake of 60 mg. A daily intake of more than 120 mg. was needed to raise the blood value to 1.4 mg. per hundred cubic centimeters, or 2.1 mg. per kilogram.—*J. Nutrition*, **19**:263, March 1940.

N. S. SIMMONS.

Noma

By ALBERT ECKSTEIN

ALTHOUGH there have been relatively few reports on noma in recent decades, the author has noted that the disease constitutes one of the most important and yet unsolved problems of Turkey. In some cases, other infectious diseases, especially malaria, seemed to predispose to or be associated with the condition, but, for the most part, the general bodily health of the forty patients observed was good.

Ten of the patients were girls, two were women and the remainder were boys. All of the children were under 12 years of age. Seasonal distribution of the cases showed greater prevalence in the summer and autumn. The clinical picture was typical. Apparently, there was no general intoxication accompanying necrobiosis, and there was no strong leukocytic response. Likewise, in the transition zone between healthy and necrotic areas observed in microscopic sections, there were degenerated epidermal cells, pigment deposits and hemorrhagic spots. There was no local tissue reaction. Gangrenous pneumonia and septicemia were the usual complications preceding death.

The author favors the theory that a specific organism or organisms are the etiologic

factor and regards the disease as a toxic form of stomatitis ulcerosa. In twelve cases, a fusiform bacillus and spirillum were isolated from surrounding healthy tissue.

The most satisfactory results were obtained by the daily local use of a non-specific antigangrene serum. (THE JOURNAL, 27:318, February 1940.) Eleven of the twenty-one patients treated in this manner recovered.—*Am. J. Dis. Child.*, 59:219, February 1940.

VIRGIL D. CHEYNE.

Massive Doses of Lugol's Solution in Acute Secondary Parotitis

By DANIEL J. LEITHAUSER and MEYER O. CANTOR

ACUTE secondary parotitis is a rare disease. It has a mortality of 30 per cent. In 1935, the authors reported treatment of ten cases without a single death. Reported here are thirteen additional cases, treated with massive doses of compound solution of iodine (Lugol's) with no deaths. One patient recovered, but died later of bronchopneumonia.

The therapeutic action of the solution in parotitis is not well understood. The authors believe that the beneficial effect must be in the constant concentrated flow of iodine through the parotids, be it antiseptic or metabolic.

The solution is administered orally, by vein and by hypodermoclysis. Twenty minims is given every three hours day and night. Abscesses often recur, and are usually multiple and discrete. The abscess should never be incised, and the pus should be aspirated daily through a large caliber needle.—*Ann. Surg.*, 111:650, April 1940.

ARTHUR F. FISHER.

Growth Disorder of the Skull in Mongolism

By CLEMENS E. BENDA

THERE are three known conditions which are associated with a marked shortening of the base of the skull: chondrodysplasia, cretinism and mongolism. The present author has added the third. In this thesis, a histologic study of the synchondrosis sphenoccipitalis; of the synchondrosis spheno-ethmoidalis, and of tissue from the vertebrae in mongolism is presented from eight cases. It is shown that proliferation of the cartilage is absent or insufficient. The growth disorder involves membranous bones as well as cartilagenous epiphyseal lines. Premature ossification does not take place. Other histologic differences between mongolism, chondrodysplasia and cretinism are mentioned and the distinction of chondrodysplasia and cretinism is discussed in detail. An analysis of the observations indicates that the development of the growth disorder appears to be dependent on a congenital absence or deficiency of those agents the presence of which, either from hypophyseal or extrahypophyseal sources, promotes differentiation and growth.—*Am. J. Path.*, 17:71, January 1940.

VIRGIL D. CHEYNE.

When Is the Time to Straighten Teeth?

By DON CHALMERS LYONS

A RECENT analysis of the questions asked by parents of their family dentist revealed that one of their most common queries was related to the time that orthodontia treatment should be started. Crooked teeth which interfere with proper mastication are divided into three groups and time of correction depends on these divisions: 1. The arch is narrow and palate high. Treatment it usually started while deciduous canines and molars are in place, provided x-ray examination reveals fully developed roots. 2. The mandible lags behind the maxillae in growth. If this is due to underdevelopment of the mandible, the case should be treated at 6 or 7 years. If it is due to the lack of facial development as a whole, treatment is usually delayed until the permanent bicuspid teeth have taken their place. 3. Lip habits and thumb sucking often cause the lower lip to lie under and behind the upper incisors. Treatment should be started as early as at 4 or 5 years in these cases.

The cross-bite is another condition which demands early treatment, as is also early loss of teeth.

The author sums up the findings by stating that the correct time for straightening teeth must, of course, vary with the individual child.—*Hygeia*, 18:320, April 1940.

ARTHUR F. FISHER.

ANNOUNCEMENTS

Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of The Journal.

CALENDAR OF MEETINGS

American Academy of Periodontology, Cleveland, Ohio, September 5-7.

American Academy of Restorative Dentistry, Cleveland, Ohio, September 7-8.

American Association for the Advancement of Oral Diagnosis, October 17-18, New York, N. Y.

American Association of Dental Editors, Cleveland, Ohio, September 7.

American Association of Public Health Dentists, Cleveland, Ohio, September 8-10.

American College of Dentists, Cleveland, Ohio, September 8.

American Congress of Physical Therapy, Cleveland, Ohio, September 2-6.

American Dental Assistants Association, Cleveland, Ohio, September 9-12.

American Dental Association, Cleveland, Ohio, September 9-13.

American Dental Hygienists' Association, Cleveland, Ohio, September 9-13.

American Public Health Association, Detroit, Mich., October 8-11.

American Society for the Promotion of Dentistry for Children, Cleveland, Ohio, September 9.

American Society of Oral Surgeons and Exodontists, Cleveland, Ohio, September 6-7.

Atlanta-Southern Dental College Alumni Association, Atlanta, Ga., June 4-6.

District of Columbia Dental Society, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

Greater New York Dental Meeting, Hotel Pennsylvania, New York, December 2-6.

International College of Dentists, Cleveland, Ohio, September 8.

University of Illinois College of Dentistry Alumni Association, Itasca, Ill., June 5.

National Dental Association, St. Louis, Mo., August 12-16.

Pierre Fauchard Academy, Ceveland, Ohio, September 9.

Dental Alumni Society, University of Pennsylvania, Philadelphia, September 19.

Northwestern University Dental School Alumni Association, Chicago, Ill., June 12-13.

Queens District Dental Society, Great Neck, N. Y., June 26.

Western Reserve University School of Dentistry Alumni Association, Cleveland, Ohio, June 10.

Wisconsin State Dental Economic Study Club, Madison, August 2-3.

STATE SOCIETIES

June

Colorado, at Colorado Springs (20-22)
Connecticut, at New London (5-7)
Idaho, at Sun Valley (24-26)
Maine, at Lakewood (23-25)
Nevada, at Reno (8)
New Hampshire, at North Conway
Oregon, at Portland (12-15)
Pennsylvania, S. S. South American (13-16)

July

New Mexico, at Santa Fe (1-3)
Utah, at Salt Lake City
Wyoming, at Rock Springs

August

Hawaii, at Honolulu

October

Southern California, at Los Angeles

November

Florida, at St. Petersburg (11-13)
Ohio, at Cincinnati

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 24. W. A. Wood, 1004 Merchants National Bank Bldg., Mobile, Secretary.

Arkansas, at Little Rock, June 17-20. Clarence W. Koch, 817 Donaghey Bldg., Little Rock, Secretary.

Arizona, at Phoenix, July 10-13. R. A. McCall, 719 Professional Bldg., Phoenix, Secretary.

California, at San Francisco, June 3, and at Los Angeles, June 24. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, June 25-29. Almond J. Cutting, Southington, Recorder.

Delaware, at Wilmington, June 5-7. Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

Florida, at Jacksonville, June 24. H. B. Pattishall, 351 St. James Bldg., Secretary.

Indiana, at Indianapolis, June 4-7. J. M. Hale, Mt. Vernon, Secretary.

Kentucky, at Louisville, June 5-8. Leon M. Childers, 1312 National Bank Bldg., Lexington, Secretary.

Louisiana, at New Orleans, June 11-15. Joseph L. Webre, 740 Audubon Bldg., New Orleans, Secretary.

Maine, at Augusta, June 26-28. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Massachusetts, at Boston, June 10-13. Francis M. Cahill, State House, Secretary.

Minnesota, at Minneapolis, June 17-22. Elmer J. Sundby, 805 Medical Arts Bldg., Duluth, Secretary.

Mississippi, at Jackson, June 18. A. B. Kelly, Yazoo, Secretary.

Montana, at Helena, July 8. Leonard A. Jenkin, 401 Ford Bldg., Great Falls, Secretary.

Nebraska, at Lincoln, June 17-22. Leonard R. Johnston, 916 Stuart Bldg., Lincoln.

New Jersey, June 24-29. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

New Mexico, at Albuquerque, June 26-29. J. J. Clark, Sr., Artesia, Secretary.

North Carolina, at Raleigh, June 24. Wilbert Jackson, Rich Building, Secretary.

North Dakota, at Fargo, July 8-11. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

Ohio, at Columbus, June 24-28. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 17-20. W. T. Longwell, Frederick, Secretary.

Pennsylvania, at Pittsburgh and Philadelphia, June 18-22. Reuben E. V. Miller, 61 North Third St., Easton, Secretary.

Rhode Island, at Providence, June 25-27. Philip J. Conley, 2 Old Colony Bldg., West Warwick, Secretary.

South Carolina, June 17-19. T. C. Sparks, Columbia, Secretary.

South Dakota, at Sioux Falls, June 24-27. C. H. Boyden, Mitchell, Secretary.

Texas, at Houston, June 17-21. B. Carl Holder, 1009 Nixon Bldg., Corpus Christi, Secretary.

Vermont, at Montpelier, June 24-26. C. I. Taggart, 139 Bank St., Burlington, Secretary.

Virginia, at Richmond, June 11. John M. Hughes, 715 Medical Arts Bldg., Richmond, Secretary.

Wisconsin, at Milwaukee, June 17-21. S. F. Donovan, Thomas, Secretary.

AMERICAN ASSOCIATION OF DENTAL EDITORS

THE American Association of Dental Editors will hold its annual meeting in the Statler Hotel, Cleveland, Ohio, Saturday, September 7. An all-day program has been arranged and editors are urged to attend.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS

THE annual meeting of the American Association of Public Health Dentists will be held in the Rose Room, Hotel Cleveland, Cleveland, Ohio, September 8-10.

F. C. CADY, *Secretary,*
U. S. Public Health Service,
Washington, D. C.

AMERICAN COLLEGE OF DENTISTS

THE Cleveland convocation of the American College of Dentists will be held in the Statler Hotel, Sunday, September 8. There will be morning, luncheon, afternoon and evening sessions.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN CONGRESS OF PHYSICAL THERAPY

THE nineteenth annual scientific and clinical session of the American Congress of Physical Therapy will be held September 2-6 at the Hotel Statler, Cleveland, Ohio. The annual instruction course in physical therapy will be given in the mornings and the scientific sessions will be held in the afternoons and evenings.

A. R. HOLLENDER, *Executive Director,*
30 North Michigan Ave.,
Chicago, Ill.

INTERNATIONAL COLLEGE OF DENTISTS

THE Mid-Year Meeting of the International College of Dentists (U. S. A. Section) will be held in the Salle Modern, Hotel Statler, Cleveland, Ohio, Sunday, September 8, at 6 p.m.

ELMER S. BEST, *Registrar,*
801 Medical Arts Bldg.,
Minneapolis, Minn.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will hold its twenty-seventh convention, August 12-16 in St. Louis, through the cooperation of the local chapter, the Mound City Dental Society. For further information, address

J. A. JACKSON, *Secretary,*
406 Commerce St.,
Charlottesville, Va.

PIERRE FAUCHARD ACADEMY

A MEETING of the Pierre Fauchard Academy will be held Monday, September 9 in Parlor C, Hotel Statler, Cleveland, Ohio.

ELMER S. BEST, *Secretary,*
801 Medical Arts Bldg.,
Minneapolis, Minn.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE next meeting of the New Mexico Board of Dental Examiners will be held June 26-29 in Albuquerque. For information concerning this meeting, address

J. J. CLARKE, SR., *Secretary,*
Artesia.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford June 25-29 for the examination of applicants for license to practice dentistry or dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

ALMOND J. CUTTING, *Recorder,*
Southington.

NEW MEXICO STATE DENTAL SOCIETY

THE New Mexico State Dental Society will hold its 1940 state meeting in Santa Fe at the La Fonda Hotel, July 1-3.

J. S. EILAR, *Secretary,*
521 First National Bank Bldg,
Albuquerque.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the State Board of Dental Examiners of Maine will be held June 26-28 at the State House, Augusta. Applications with necessary fee must be in the hands of the secretary at least ten days prior to the date of examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

THE next examination to be conducted by the Massachusetts Board of Dental Examiners will be held in Boston, June 10-13. All applications must be filed at the office of the secretary at least ten days before the dates set for the examination. For further information, address

FRANCIS M. CAHILL, *Secretary,*
State House,
Boston.

DENTAL COUNCIL AND EXAMINING BOARD OF COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will

conduct examinations in Philadelphia and Pittsburgh, June 18-22. For information and applicant blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg, or

REUBEN V. MILLER, *Secretary,*
61 North Third St.,
Easton.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet June 24-26 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, together with examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. Address all communications to

C. I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE next annual meeting of the American Dental Hygienists' Association will be held in Cleveland, Ohio, September 9-13, with headquarters at the Hotel Carter.

A. REBEKAH FISK, *Secretary,*
Walter Reed Gen. Hospital,
Washington, D. C.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS, REGULAR ARMY

AN examination for the selection of candidates for appointment in the Dental Corps, Regular Army, will be held during the period July 15-20. The examination, which will include both physical and professional examinations, the latter consisting of written, oral and clinical tests, is open to male citizens of the United States who will be not over 32 years of age at the time it will be possible to render a commission, who are graduates of acceptable dental schools and who have had at least two years subsequent practice in their profession at the time of appointment.

Candidates who fail on the first examination will not be permitted to take more than one subsequent examination.

Full information and application blanks will be furnished on request to the Adjutant General, War Department, Washington, D. C. Applications will not be considered after June 29.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A COMPETITIVE examination to select not more than twenty for appointment in the Dental Corps of the Navy will be held July 8 at the Naval Medical School, Washington, D. C.; Naval Training Station, Great Lakes, Ill., and Naval Training Station, San Diego, Calif. A candidate for appointment in the Dental Corps must be a citizen of the United States, between 21 and 32 years of age at the time of appointment and a graduate of a standard dental college. A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

DENTAL INTERNSHIP

APPLICATIONS are now in order for appointment to a twelve-month internship, beginning July 1, at St. Luke's Hospital, Morningside Heights, New York, N. Y. The dental intern will be instructed in a wide variety of dental activities. Applications should be made as soon as possible, stating qualifications. In applying, address

JEROME M. SCHWEITZER, D.D.S.,
Chief of Dental Department.

PUBLICATION AND SALE OF THE PROCEEDINGS OF THE DENTAL CENTENARY CELEBRATION HELD AT BALTIMORE, MD., MARCH 18, 19, 20, 1940

A COMPLETE report of the transactions of the Dental Centenary will be printed in book form, approximately 800 pages, 400 cuts attractively arranged and carefully edited, indexed and ready for use. A record of this important event in dental history will be one of the most valuable features of the future library. The Centenary Committee has arranged for the sale of the proceedings, subject to future delivery. In order to en-

courage wide distribution of the text, it is offered at $5 a copy.

Send subscriptions to

EARL W. SWINEHART, *Chairman,*
Publicity Committee,
Medical Arts Bldg.,
Baltimore, Md.

ALUMNI ASSOCIATION, ATLANTA-SOUTHERN DENTAL COLLEGE

THE eighth annual meeting of the Alumni Association of the Atlanta-Southern Dental College will be held June 4-6 at the College Building, 106 Forrest Ave., N.E., Atlanta, Ga.

W. EDGAR COLEMAN, *Secretary,*
106 Forrest Ave., N.E.,
Atlanta, Ga.

ALUMNI ASSOCIATION, UNIVERSITY OF ILLINOIS COLLEGE OF DENTISTRY

THE annual alumni outing of the Alumni Association of the University of Illinois College of Dentistry will be held Wednesday June 5 at the Itasca (Ill.) Country Club. The classes of 1900, 1910, 1920 and 1930 will be honored and the members of the class of 1940 will be guests.

RALPH WISHNEFF, *General Chairman.*

NORTHWESTERN UNIVERSITY DENTAL SCHOOL ALUMNI ASSOCIATION

THE Northwestern University Dental School Alumni Association will hold its annual homecoming clinic and golf day June 12-13. Wednesday, June 12, will be spent at the Ward Memorial Building, 311 East Chicago Ave., Chicago, 9 a.m. to 5 p.m.

GEORGE W. TEUSCHER, *Secretary,*
55 East Washington St.,
Chicago, Ill.

WESTERN RESERVE UNIVERSITY SCHOOL OF DENTISTRY ALUMNI ASSOCIATION

THE clinic and homecoming of the Western Reserve University School of Dentistry Alumni Association will be held Monday, June 10, beginning at 1 p.m. at the university. At 6:30 p.m., the class reunion dinner will be held at the Mid-Day Club.

C. J. STARK, *Secretary.*

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING APRIL 1940

April 2

No. 2,195,452, REINER W. ERDLE. Method of making articles of porcelain.

No. 2,195,526, MERRICK K. TREVOR. Illuminated mirror.

No. 2,195,555, HAROLD H. BEARDSLEY. Contra-angle dental handpiece.

No. 2,196,150, ROBERT FRANKLIN HEALD & ROBERT JAMES MEHAFFEY. Tooth powder.

No. 2,196,154, ALBERT LYLE SCHULERUD. Dentifrice.

April 9

No. 2,196,258, REINER W. ERDLE. Method of molding ceramic articles.

No. 2,196,284, DOLETTA M. ACKERMAN. Gum massaging implement.

No. 2,196,505, CHARLES DALE MORTON. Cast fixed bridge.

No. 2,196,515, SPENCER R. ATKINSON. Orthodontic appliance and method of producing the same.

No. 2,196,516, SPENCER R. ATKINSON. Orthodontic appliance and method of producing the same.

No. 2,196,566, ETHEL SABATTIS. Dental plate case.

No. 2,196,667, TOMLINSON I. MOSELEY. Electric toothbrush.

No. 2,196,896, WILLIAM A. DVORAK. Dental matrix.

April 16

No. 2,197,345, MAXIMILIAN C. MEYER. Dental floss holder.

April 30

No. 2,198,666, BENJAMIN GRUSKIN. Syringe.

No. 2,198,773, ERNEST L. HOLLENBECK. Fountain brush and tube holder.

IF you want answers to dental questions—

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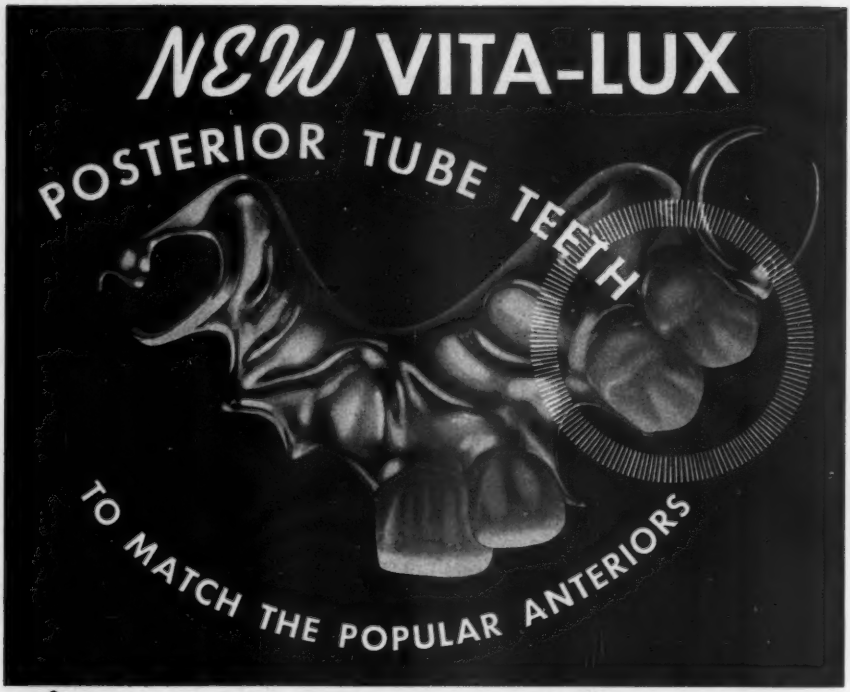

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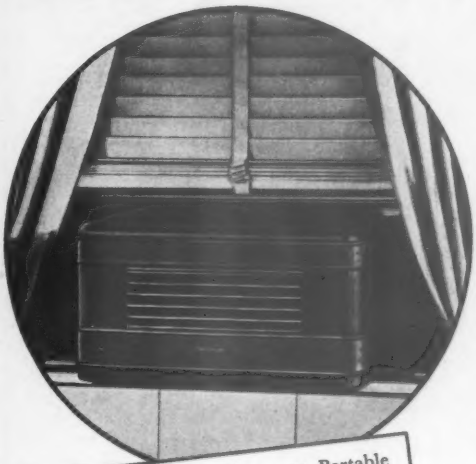

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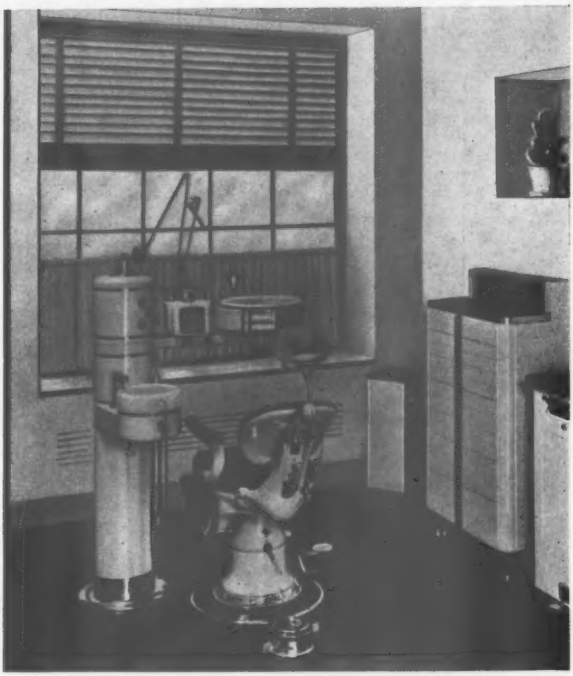

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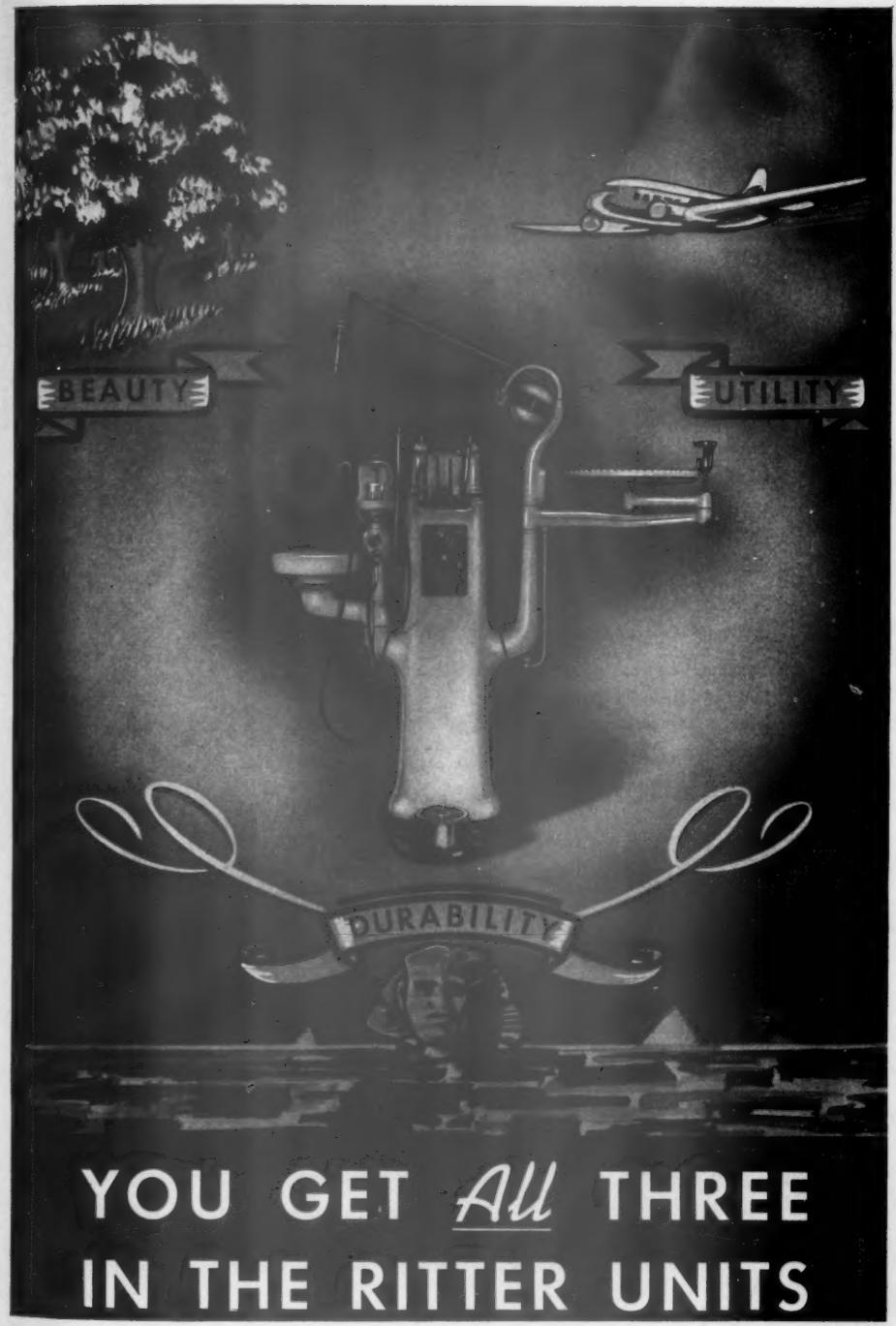
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UTILITY
DURABILITY
YOU GET All THREE
IN THE RITTER UNITS

A connected technic for pulp canal work-

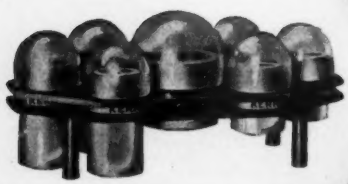
FOR root canal work this company alone supplies all equipment and materials necessary for a complete connected technic. This unit enables you to maintain continuous asepsis necessary in any surgical operation. You can work faster and better with these correlated instruments at your fingertips.

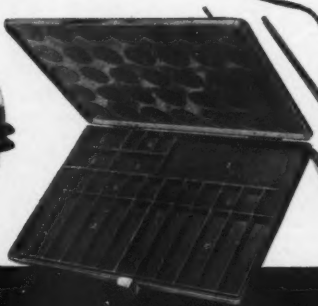
KERR files and reamers in all sizes are each plainly numbered and easily identifiable as they stand in the dip-wells of your KERR alcohol sterilizer.

A Kerr pulp canal instrument case keeps all your instruments orderly and ready for instant use.

Systematize your pulp canal operations by standardizing on KERR instruments, instrument case, sterilizer, sealer and technic. A copy of the technic will be promptly forwarded post-paid on your request.

KERR DENTAL MFG. CO., DETROIT





KERR PULP CANAL EQUIPMENT

REG. U.S. PAT. OFF.

"The Centennial of American Dentistry"—

2 ways to get perfect cementations...

FLECK'S CEMENT Oxy-Phosphate

Fleck's provides a "safety margin" for each of its physical properties. For example: Its strength is equal to two cements—its resistance to disintegration 10 times greater than standard requirements and its film thickness 3 times finer than ordinary cement.

Fleck's cementations can be depended upon in important *extra* years of efficient service.

FLECK'S CEMENT Red Copper

Combines the physical attributes of Fleck's Zinc Cement with the constant germicidal action of Fleck's Red Copper *(this was proved beyond question when Fleck's led the field in all 21 tests in the most comprehensive research ever conducted on Copper Cements)*. This permanently germicidal cement is indispensably valuable to Dental practice—particularly in children's dentistry.

MIZZY, INC. 105 E. 16 ST., NEW YORK

In LAST MONTH'S ADVERTISEMENT WE OFFERED TO THE PROFESSION BEAUTIFUL SPECIMEN CASES *Free* . . .

We are happy to announce that these specimen cases are nearing completion

See YOUR NEAREST DISTRIBUTOR OF DR. MYERSON'S TEETH *Now!*

OR MAIL COUPON

Applications taken in order of date of receipt

IDEAL TOOTH INCORPORATED, CAMBRIDGE, MASSACHUSETTS

Please advise me where I may obtain the Free specimen cases you advertised.

Dr. _____ Address _____

City _____ State _____

Make the Journal Your Buyers' Guide—

Confident in her dentist and his work. Appreciative of his sympathetic understanding. Loyal!

Is this your patient?

Small things—if they are the right things—can play a big part in fostering such loyalty . . . and in strengthening the bond between you and your patients.

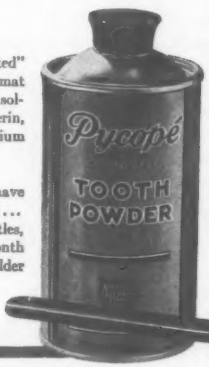
For instance, *one* of the wise things you can do is prescribe Pycopé Tooth Powder and Pycopé Tooth Brushes. This is *your* powder—*your* brush—*never publicly advertised!*

Because recommendation of these ethical products represents your special knowledge in the dentifrice and tooth brush field . . . they readily become symbols of your concern for your patients' well-being . . . a thoughtfulness which patients are quick to appreciate.

PYCOPÉ, Inc., 2 High St., Jersey City, N. J.

PYCOPÉ "Council Accepted" TOOTH POWDER can't mat a brush . . . is immediately soluble . . . contains no glycerin, grit, acid, soap . . . no sodium perborate.

PYCOPÉ BRUSHES have small heads, rigid handles . . . scientifically spaced bristles, wedge-cut tufts . . . a two-month guarantee. Educational folder included



IT'S GOOD PRACTICE TO PRESCRIBE

PYCOPÉ

PY-KO-PAY

TOOTH POWDER & TOOTH BRUSHES

The spotlight now turns to PALLADIUM in dental golds

YOU WILL have a better appreciation of the usefulness of palladium when you realize how it improves and adds to the serviceability of the gold alloys used in dentistry.

(1) Gold alloys containing palladium are easy to cast quickly, readily manipulated and are easily polished to a high lustre.

(2) Many of these alloys are responsive to heat treatment. For more accurate adaptation you can soften an appliance, then re-harden it to great strength with proper resiliency for comfortable, dependable service.

(3) When necessary you can work these palladium alloys without annealing for minor comfort adjustments.

(4) A wide range of colors is available for your selection—from yellow gold to platinum white.

And of equal, if not greater importance, palladium enhances the inherent corrosion-resistance of gold alloys.

Golds containing palladium, often in combination with platinum, are available from your usual sources of supply for dental materials.

PLATINUM - PALLADIUM - GOLDS

Platinum Metals Division

THE INTERNATIONAL NICKEL COMPANY INC.

67 Wall Street, New York, N. Y.

THE INORGANIC OR MINERAL ELEMENTS IN NUTRITION

"The functions of minerals are so important that they may well be said to control life itself." (1)

●With this terse statement, a recent monograph summarizes the importance of minerals in animal metabolism.

Earlier physiologists considered the following list of inorganic elements to be fairly complete as far as animal nutrition was concerned:

Calcium	Sodium	Phosphorus
Iron	Potassium	Chlorine
Iodine	Magnesium	Sulfur

However, copper, manganese, zinc, and apparently cobalt must now be added to this list of elements considered indispensable or desirable in nutrition. Also, analyses of animal tissues have disclosed the presence of the so-called "trace elements" (aluminum, silicon, arsenic, fluorine, bromine, barium, rubidium, nickel, and selenium). Which of these perform definite roles in mammalian metabolism and which are present as contaminants, future research alone can decide (2).

Although the specific functions of all the essential minerals may not be completely known, it is apparent that many of these inorganic elements—in the form of their salts or ions—are associated with vital body activities. Thus, the initiation and continuance of cardiac function, the maintenance of osmotic relationships of tissues and of the acid-alkaline balance, and the formation of bony and calcareous tissue and of hemoglobin are a few of the vital functions of the minerals (1). It should be evident that the above quotation is in no wise an overstatement of the importance of the minerals in nutrition.

As to their occurrence in nature, the minerals are rather widely distributed in foods, although the extent to which they may occur—even in the same food variety—is known to be variable (3). No one food or class of foods has been richly endowed with *all* the elements essential in nutrition. Consequently, to insure an optimal intake of minerals the diet should be planned to include—in so far as possible—all food classes.

In the preparation of foods for the table, attention should be given to preservation of their mineral values. Because of their water-soluble nature, certain minerals may be lost to the cooking water during food preparation. Therefore, to obtain the full mineral benefits of foods, the cooking water containing the extracted minerals should in some way be utilized.

During commercial canning, food is cooked in a limited amount of water or brine while contained in the sealed can. Thus, solution losses of inorganic elements are controlled and by using the entire contents of the container the consumer will obtain all the mineral values of the food packed therein. This provision in practically all commercial canning procedures renders canned foods valuable and convenient in formulation of diets calculated to supply optimal amounts of the inorganic elements essential for complete human nutrition.

AMERICAN CAN COMPANY
230 Park Avenue, New York, N. Y.

REFERENCES

(1) 1939. Mineral Metabolism, Alfred T. Shohl, Reinhold, New York.

(2) 1940. Nutrition Abstracts and Reviews 9, 515.

(3) 1938. Univ. Colorado Studies 25, 181.

We want to make this series valuable to you, so we ask your help. Will you tell us on a post card addressed to the American Can Company, New York, N. Y., what phases of canned-foods knowledge are of greatest interest to you? Your suggestions will determine the subject matter of future articles. This is the sixtieth in a series, which summarizes, for your convenience, the conclusions about canned foods reached by authorities in nutritional research.

The Seal of Acceptance denotes that the statements in this advertisement are acceptable to the Council on Foods of the American Medical Association.

Color HARMONY

● Williams "6" *All-Purpose* casting gold achieves in the mouth a color harmony inconspicuous in its beauty! In using Williams "6" for a restoration, you can be sure of "match" in color harmony when the patient needs later restorations. Unexcelled for *ALL* types of castings—inlays, fixed bridgework, partial dentures. Stocked by your dealer. Williams Gold Refining Company, Buffalo, N. Y.; Fort Erie, No., Ont.; Havana, Cuba.

Williams 6 all purpose CASTING GOLD

A PERFECT PLATE
...Yet a mental hazard

AUTHORITIES SAY
NEW-DENTURE SUCCESS
60% MENTAL

Why are so many fine dentures doomed to be discarded? Because even the best-made plate is a huge, hard, foreign mass in a mouth that's never worn one. Exerting a biting pressure of 15 to 25 pounds, it torments tender gums . . . often becomes a "mental handicap"... and may end up, unused, in a bureau drawer. Unfortunately, no compliment to the dentist who made it!

EVEN THE FINEST PLATES NEED SHOCK ABSORBERS. That's why during the difficult "learning period," thousands of thoughtful dentists prescribe DR. WERNET'S Powder . . . to provide a protective comfort cushion . . . to lessen irritation . . . to promote ease and assurance . . . to speed denture mastery...and to insure denture success!

A leader for almost 30 years, DR. WERNET'S Powder is never advertised to the public. We believe only a dentist is qualified to prescribe its use.

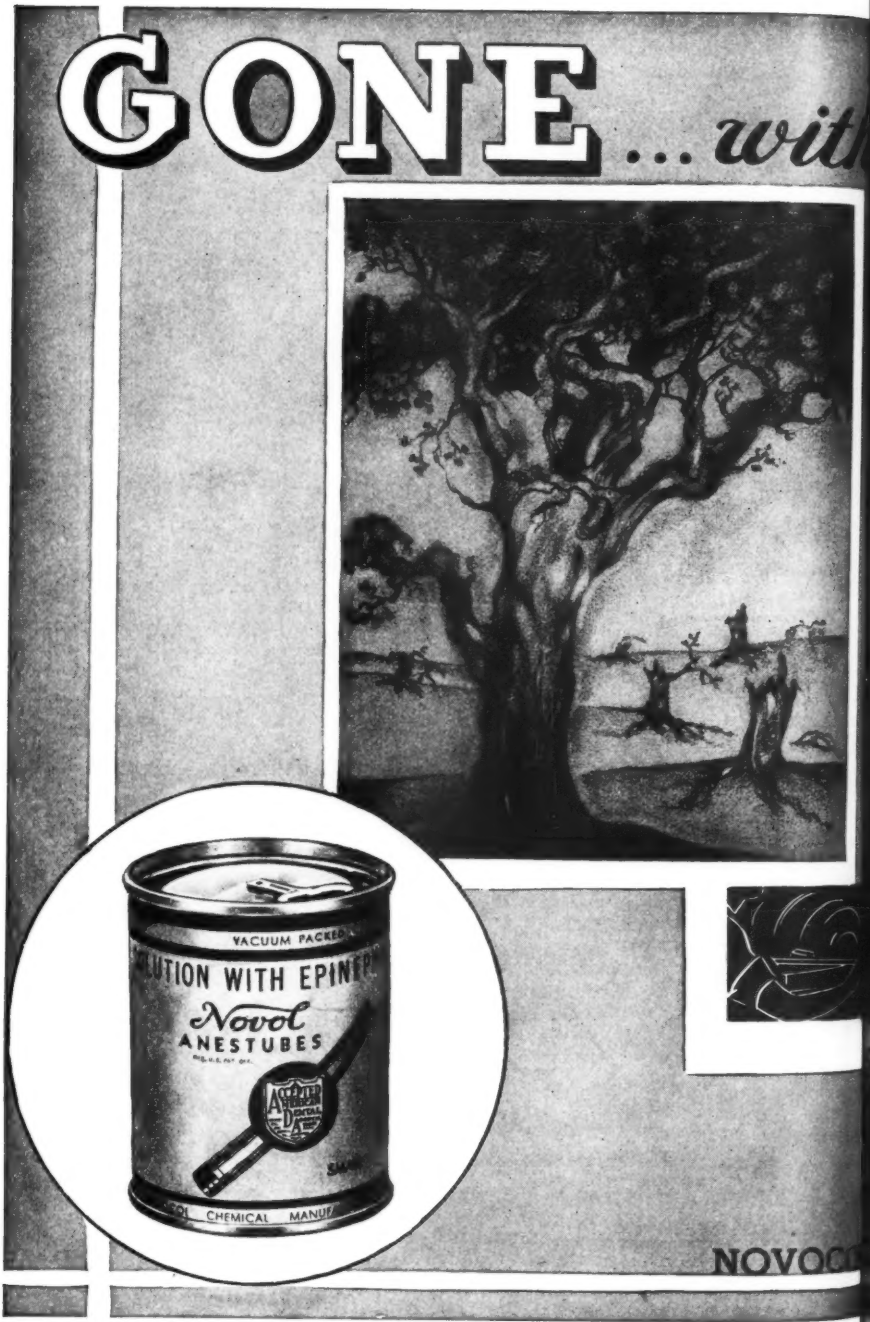
SEND FOR YOUR FREE SUPPLY! Mail lower portion of this page, with your card, or letterhead, to Wernet Dental Mfg. Co., Dept. A, 190 Baldwin Ave., Jersey City, New Jersey.

IMPARTIAL LABORATORY TESTS SHOW
DR. WERNET'S POWDER
26.1% WHITER
50% MORE VISCOUS
46.8% MORE ABSORBENT
THAN AVERAGE OF 5 LARGEST-SELLING BRANDS TESTED

NEARLY 50,000 DENTISTS USE AND RECOMMEND

DR. WERNET'S POWDER

Completes your Denture Service



"The Centennial of American Dentistry"—

with the wind...

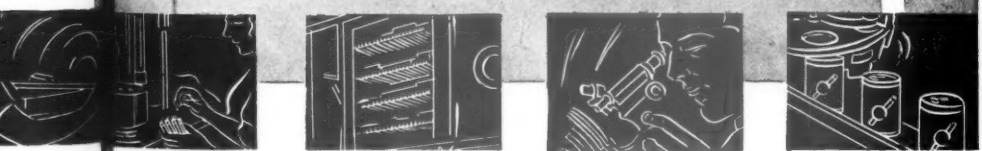
It is a great temptation to hitch on to a going vehicle and try to get a free ride to success. Some think that because a little procaine dissolved in water will produce anesthesia, it is easy to make a local anesthetic and palm it off on the dental profession.

During the quarter of a century of Novol's existence, hundreds of local anesthetics have come, flourished for a brief period, been bent and broken by the test of time. Gone with the wind. They all have fancy names, but their stock in trade is always the same—"Cheaper and just as good."

There is more to the making of a local anesthetic than the magic of procaine. The most important constituent is the conscience and faith of the maker, in whose hands are the reputation of the practitioner and the health, comfort and safety of his patients.

Some 25,000 square feet of space with 125 workers are devoted to the task of making Novol Anesthetics. For exactitude, all glass containers are made in our laboratories, checked carefully through the polariscope for invisible strains, and then reannealed in special automatically-controlled ovens to restore the temper... a precaution against breakage. Then comes the making of procaine and careful analysis of all the raw materials.

The anesthetic solution is made and passed through specially constructed bacteria-eliminating filters. Stringent tests are conducted for sterility, isotonicity, hemolysis, toxicity, osmosis, hydrogen-ion concentration, etc. Final clinical tests on patients follow. There are no less than 77 distinct steps and precautions taken before the product passes final inspection, and is permitted to go out to the four corners of the world for the 25,000,000 injections that are yearly made with all Novol containers—Ampules, Anestubes, Novampuls and Alkatubes.



Novol—*the world's most extensively used local anesthetic!*

When human life is concerned, the price element must not be considered. Nothing is too good or too precious to be injected into the delicate alkaline tissue cells of living human beings. It is not so much the value of the anesthetic solution within the container that counts, but the protection and peace of mind assured by its painstaking preparation.

NOVOCHEMICAL MANUFACTURING CO., INC.

2921 ATLANTIC AVENUE BROOKLYN, N. Y. SAN FRANCISCO · TORONTO LONDON

3 VALID REASONS

Why So Many Dentists PRESCRIBE LACTONA TOOTHBRUSHES

1. The special rubber Tooth-Tip reduces to easy, every-day practice the advice you have given to the patient.

2. Every edge and surface of the specially designed Lactona brush handle is carefully rounded and perfectly smooth.

3. The Lactona Tooth brush is the ONLY brush on the market with a comparably trim and compact brush head. There is no excess width or handle bulk to interfere with effective use of the widely spaced bristle knots. This advantage is only accomplished by fine precision in manufacture. No other brush has the bristle pattern stapled so closely to the edges of a carefully rounded handle.

Lactona brushes, in bright new handle colors, are available in the bristle texture of your preference. Only the best imported natural black, regular unbleached, and white (bleached) bristle is used in Lactona Tooth-Tip Toothbrushes.

For Special Trial Offer, limited to registered dentists only, please use coupon.

SPECIAL TRIAL OFFER

Lactona, Inc., St. Paul, Minn.

This offer at 20c per brush, to cover cost of mailing, handling, etc., limited to 2 brushes to each dentist. Please indicate bristle texture and handle color.

☐ Extra Hard Unbleached

☐ Hard Unbleached ☐ Extra Hard Black ☐ Hard White (Bleached)

☐ Medium Unbleached ☐ Hard Black ☐ Medium White (Bleached)

Indicate Handle Color_____

Dr._____

Address_____

City_____

Be sure to specify bristle texture. This special trial offer limited to registered dentists only.

USE COUPON FOR SPECIAL BRUSH OFFER

Copies suitable for framing on request

A section from the painting "Beaumont and St. Martin" by Cornwell, now being shown at medical schools throughout the United States

John Wyeth & Brother, Incorporated

MAKERS OF FINE PHARMACEUTICALS SINCE 1860

The Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania

The School of Dentistry of the University of Pennsylvania was organized in the early part of 1878. In 1909 The Pennsylvania College of Dental Surgery was merged into the School of Dentistry of the University, and in 1916 the merger of the Medico-Chirurgical College of Philadelphia and the University of Pennsylvania was effected, and the students of the Dental Department of the former were admitted to the Dental School of the University.

In 1915 the School moved to its present home, the Evans Institute, a building erected by the Thomas W. Evans Institute Society, which entered into a cooperative affiliation with the University, whereby the Society contributed its material resources for the conduct, maintenance and improvement of the Dental School, while the University furnished its facilities for furnishing instruction in the fundamental medical subjects, in dental subjects and its social and education advantages.

"

Copies of the painting by the eminent artist, Charles Pizer, suitable for framing will be sent on request.

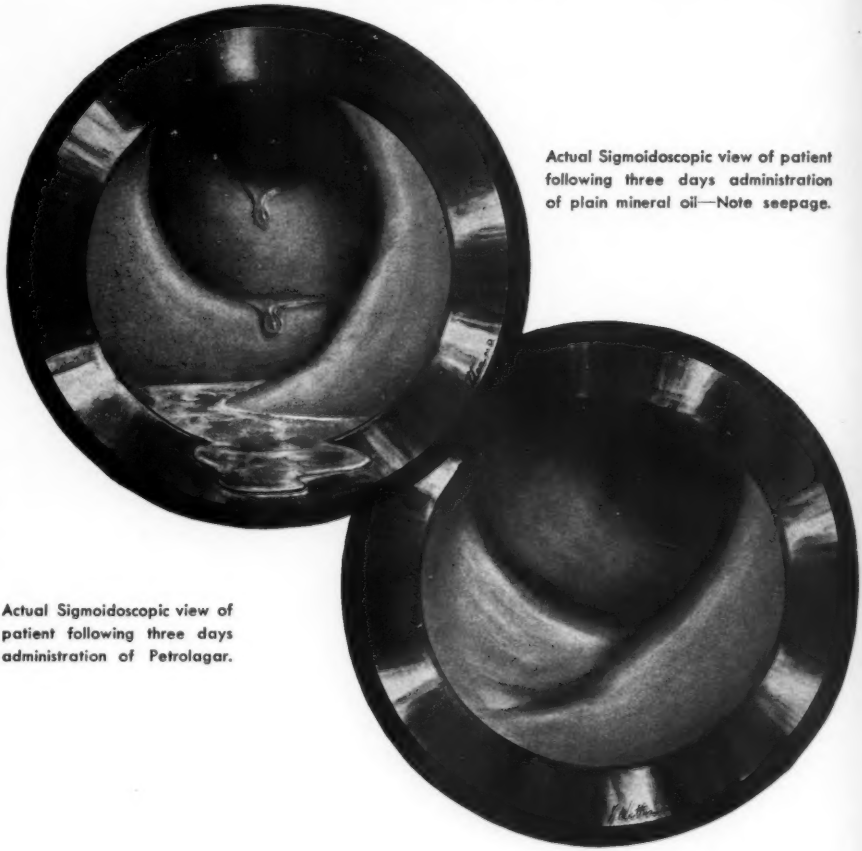
THE KOLYNOS COMPANY • NEW HAVEN, CONN.

KOLYNOS

A Concentrated Dental Cream

Lubrication alone is not enough . .

FOR COMFORTABLE BOWEL MOVEMEN



Actual Sigmoidoscopic view of patient following three days administration of plain mineral oil—Note seepage.

Actual Sigmoidoscopic view of patient following three days administration of Petrolagar.

It is essential to obtain a soft formed, yielding, easily passed stool. Petrolagar softens as well as lubricates the feces. It is a fine oil-emulsion which mixes intimately with the bowel contents. The microscopic globules of oil in Petrolagar are enclosed in a film of aqueous agar-gel that enables them to penetrate the fecal mass as it forms.

The even distribution of these globules assures a soft consistency of the stool and the increase of bulk brings about natural waves of the bowel muscle. Petrolagar thus provides satisfying, comfortable bowel movement.

● Free Samples to the Profession on request.

Petrolagar—Liquid Petrolatum 65 cc. emulsified with 0.4 Gm. Agar in a menstruum to make 100 cc.

Petrolagar

Petrolagar Laboratories, Inc. • 8134 McCormick Boulevard, Chicago, Ill.

It's the Little Things in Life . . .

Little things, yes—precious baby teeth like "small fry's" here—but they count in bringing up healthy, happy children.

Little things count, too, in making dental x-ray machines, and it's the little extra refinements that distinguish the G-E CDX Dental X-Ray Unit from the others.

The small, compact tube head, easy to see around, easy to manipulate horizontally as well as vertically.

The device that lets us set CDX to fit your height so you don't have to bend or stretch to use it.

The variety of models—wall, stationary, mobile —a type to suit your taste and fit your office.

And a host of other attentions to detail, some intangible—inherent in the skill of our craftsmen and the experience of 45 years.

All these little extra features make the difference between ordinary and high quality work, between ordinary and superior ease-of-operation, between ordinary and CDX x-ray units.

And they all add up to a mighty big reason for investigating CDX first. To do so, fill in and mail the convenient coupon—fill it in right now!

Please send me—without obligation—a copy of your new CDX catalog.

Dr. _____

Address _____

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Dealer _____

GENERAL ELECTRIC
X-RAY CORPORATION
2012 JACKSON BLVD. CHICAGO, ILL., U. S. A.
HI16

THE ONLY
COMPLETE LINE
OF DENTAL
X-RAY FILMS

TOOZ, 2-IN-1 X-RAY FILMS
MINIMAX X-RAY FILMS,
SINGLES
MINIMAX X-RAY FILMS,
DOUBLES

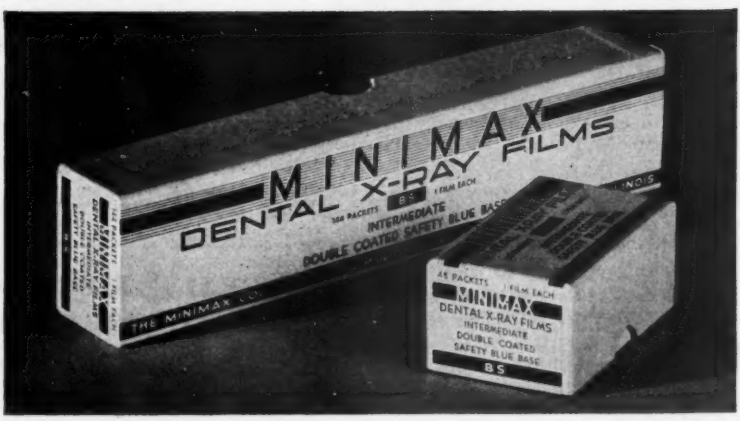
ALL MINIMAX x-ray films are supplied in three distinct types: Regular Slow, Intermediate Blue Base and Intermediate Clear Base, in boxes of one gross and boxes of four dozen.

NEW LOWER PRICES

	1 Gross	4 Doz.
TOOZ, Regular Slow	$3.50	$1.25
TOOZ, Int. Clear Base	4.50	1.70
TOOZ, Int. Blue Base	4.75	1.80
Singles, Regular Slow "RS"	2.25	.80
Singles, Int. Clear Base "CS"	2.75	1.00
Singles, Int. Blue Base "BS"	3.00	1.10
Doubles, Regular Slow "RD"	2.75	1.00
Doubles, Int. Clear Base "CD"	3.50	1.25
Doubles, Int. Blue Base "BD"	3.75	1.35

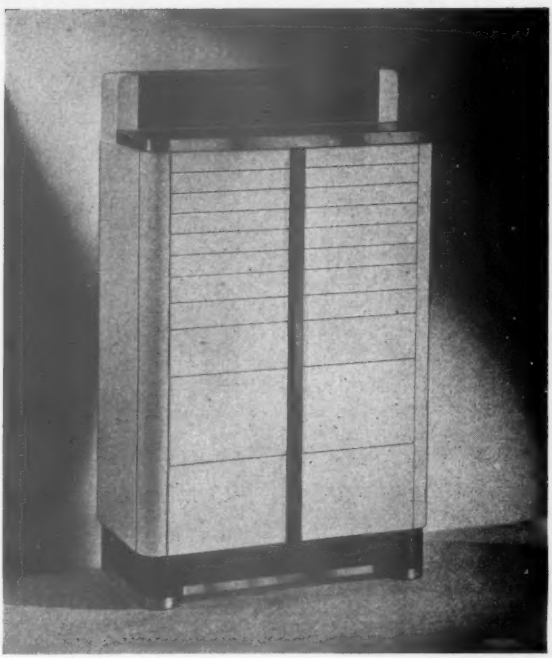
YOU can get Minimax quality in your preferred type of x-ray film. Minimax offers you in addition to TOOZ, the 2-in-1 x-ray film, "singles" and "doubles" so if you want only one radiograph of a tooth, duplicate radiographs of the same area or two different radiographs with the use of only one packet, Minimax produces film that is tailored for the task!

The MINIMAX Co.
MEDICAL & DENTAL ARTS BLDG. CHICAGO



"The Centennial of American Dentistry"—

For Easy Operation..



Features!

New features of the No. 147 Dental Cabinet are . . . Roller Suspension Drawers . . . Catalin Pulls . . . Dust Proof Instrument Drawers . . . Modern Design . . . Silent Wood-Steel Drawers . . . Ten Full-Width Drawers . . . Cement and Porcelain Tray . . . X-Ray Film Box . . . Concealed Medicine Compartment . . . Eighteen Glass Trays . . . Formica Working Surface . . . Toe Space.

Roller Drawers Operate Easily and Quietly

For easy drawer operation the steel drawers of the No. 147 AMERICAN Cabinet are equipped with roller suspension so that they glide in and out of the cabinet at the touch of the finger-tip.

In addition, these drawers are individually dust-proofed with a steel dust cover between each drawer. The dust cover has a rubber lip which effectively seals the drawer against dust and dirt when it is closed.

This No. 147 Cabinet and other operating cabinets are described in detail in the AMERICAN DENTAL MANUAL. Send for your copy NOW!

THE AMERICAN CABINET CO., Two Rivers, Wis.

Gentlemen: Please send me a copy of the AMERICAN DENTAL MANUAL. ADA 6-40

Name .....

Address .....

City and State .....

A NEW "Open-Easy" PACKET FOR EASTMAN DENTAL FILMS

AGAIN Eastman improves the dental film packet—this time with two parallel lines of perforations across the paper backing. A pull on the tab rips off a strip through the center . . . then the packet opens with the motion of opening a book. All Eastman periapical dental x-ray films in standard-size packets now have this timesaving convenience.

All the other familiar features of the Eastman dental x-ray film packets that protect the film against moisture and fogging, that facilitate proper manipulation yet safeguard against discomfort to the patient, are retained.

4 TYPES OF FILM

Your regular dental dealer has these Eastman periapical dental films in the new "open-easy" packet—single- and 2-film:

Eastman R-P (Rapid-Processing)—double emulsion; "intermediate" exposure; 2 minutes' development at 65° F.

Eastman Radia-Tized—double emulsion; "intermediate" exposure; 5 min. development at 65° F.

Eastman C (Regular-Slow)—single emulsion; "slow" exposure; 5 min. development at 65° F.

Eastman CC (Extra-Fast)—single emulsion; "fast" exposure; 5 min. development at 65° F.

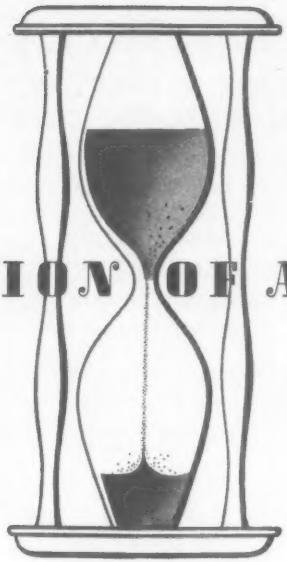
Order the type you prefer, today, in either the economical gross dispenser package or in 2-dozen packages. . . . Eastman Kodak Company, *Medical Division*, Rochester, N. Y.

Price reductions up to 25% on these Eastman periapical dental x-ray films, as well as the two types of Eastman Occlusal Film, were announced early in April.

BE SURE TO VISIT THE KODAK BUILDING AT THE NEW YORK WORLD'S FAIR

EASTMAN X-RAY MATERIALS

THE ONLY COMPLETE LINE



DURATION OF ACTION

HIGH disinfecting power and relative freedom from irritation are the three essentials of an antiseptic. The superiority of Tincture Metaphen in these respects is emphasized by a recent comparative study* of fifteen commonly used antiseptics. On the oral mucosa, Tincture Metaphen was found to have, in substantial excess over any other antiseptic tested, *a duration of action of two hours; to reduce bacterial count 95 to 100% within five minutes;* and to cause only a slight irritation in some cases, no irritation in the others. Abbott Laboratories, North Chicago, Ill.

*Meyer, E., and Arnold L. (1938), Amer. J. Digest. Dis., 5:418

Tincture *Metaphen*

COMPLETE LITERATURE ON REQUEST

(Tincture of 4-nitro-anhydro-hydroxy-mercury-orthocresol, 1:200, Abbott)

Teeth, Health and Appearance

THIS BEAUTIFUL BOOK ANSWERS MOST OF THE MORE IMPORTANT DENTAL QUESTIONS

INDISPENSABLE FOR OFFICE, SCHOOL AND LIBRARY

AUTHORITATIVE
ARTISTIC
INFORMATIVE
INEXPENSIVE

Forty-eight 10½x14 inch pages illustrated with one hundred and one pictures, fifty of which are in four colors.

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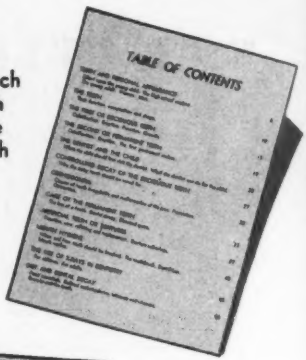
CLOTH COVER
Only

$1.50 postpaid



THE BUREAU OF PUBLIC RELATIONS - AMERICAN DENTAL ASSOCIATION
212 E. Superior St., Chicago, Ill.

THE BUREAU OF PUBLIC RELATIONS
AMERICAN DENTAL ASSOCIATION
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A BENEFICIAL PRODUCTION CIRCLE

Enclosed is $1.50 for copy of TEETH, HEALTH AND APPEARANCE.

Name_____

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Please print plainly full name and complete address

"The Centennial of American Dentistry"—

TESTED and PROVED by 35 YEARS OF CONSTANT USE

The use of PROCAINE HYDROCHLORIDE as a local anesthetic, was first discovered in 1905, just 35 years ago, by Einhorn . . . . . This discovery was one of the most progressive steps in the advance of Modern Dentistry.

PROCAINE is about one-seventh as toxic as cocaine. Its action is slower than cocaine but when properly injected, it is very efficient, and when employed as a vaso-constrictor, such as Neo-Synephrin, gives a prolonged anesthesia, sufficient for usual dental operations.

For many years, Proco-Sol Procaine Solutions, with Neo-Synephrin or with Epinephrin, have been used by the dental profession throughout the World with most satisfying results.

On your next order from your local dealer, specify "Proco-Sol" Procaine with Neo-Synephrin Hydrochloride; or with Epinephrin . . . Free Samples gladly sent upon request.

ACCEPTED AMERICAN DENTAL ASSOCIATION

PROCO-SOL CHEMICAL COMPANY, INC.

1233 SPRING GARDEN STREET, PHILADELPHIA, PA.

Steele's Super Investment, the all-purpose dental investment, meets every requirement.

Super Investment accurately reproduces the very finest detail, making it equally suitable for the casting of inlays or the largest restoration. It provides complete protection to the physical properties of casting golds and embedded metals during pre-casting burn-out.

In Soldering or in pre-casting burn-out Super Investment adsorbs corrosive gases, leaving the work with a true gold color, the physical properties unimpaired.

For model work Super Investment's smooth hard surface improves detail and accuracy.

The originators of Steele's Interchangeable Teeth recommend Super Investment for your every investment need.

The Columbus Dental Mfg. Co., Columbus, Ohio, U.S.A.

PRESCRIBE THIS MODERN BRUSH

Dr. West's Miracle-Tuft ORO

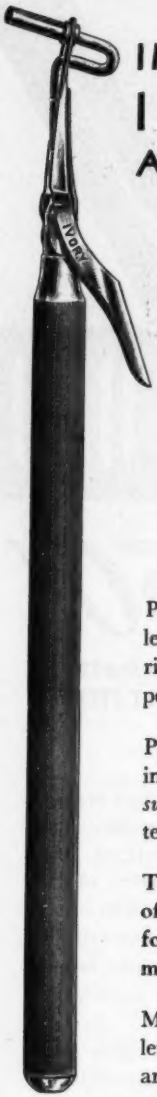
50¢

**SEALED IN GLASS . . .
SURGICALLY STERILE!**

Brush-head is 1⅛" long. Bristle tufts are widely spaced in two rows of 6 tufts each, and properly trimmed for interproximal massage brushing. Two textures—hard and medium.

● Here is a toothbrush you can recommend to your patients unreservedly—one *without bristle troubles* . . . splitting, softening or shedding. The discovery of Du Pont Exton made it possible. Exton is a bristle-like filament that is non-porous, water-repellent to a degree never before possible, strong and resilient even when wet.

The ORO brush is ideal for gum massage as well as for brushing the occlusal, labial, lingual and interdontal surfaces of the teeth. Its bristles are unaffected by peroxides, perborates or the surgical antiseptics. And, conservatively, a Miracle-Tuft ORO brush will outlast any natural-bristle brush more than two to one.



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Place finger under lever when filling carrier. Press lever to expel amalgam.

Places the amalgam in *small, large* or *fissure* cavities, no matter where situated.

The cone socket end of handle to be used for amalgam instruments.

Maintain pressure on lever to attach first amalgam in cavity.

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THE WONDER ELECTRIC MORTAR AND PESTLE

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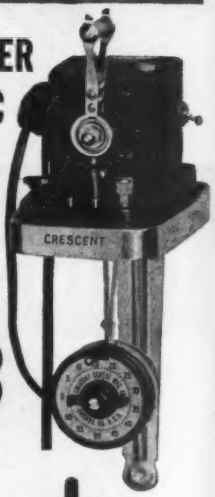

ONLY 7 to 10 SECONDS are required to triturate enough amalgam for an ordinary size filling with the WIG-L-BUG, the wonder electric mortar and pestle. Its mix is a smooth fine texture...always the same! Assures better, faster, more successful fillings! Write today for descriptive, illustrated literature.

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PLASTIC CAKE
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MOLD THEM YOURSELF AND GIVE THEM TO YOUR CHILD PATIENTS

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Snow White is 5¾ inches in height; the Dwarfs are 3¾ inches in height.

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Tooth Minerals Equally Important

Calcium and phosphorus which compose more than 95% of the teeth must also be supplied in abundance for building and nourishing the teeth. *They depend primarily upon Vitamin D for proper utilization.* Speaking of the importance of these nutrients, Mary Swartz Rose, Ph.D., Columbia University, writes: "In regard to calcium, we must pin our faith to the teachings of science, and not trust to the outward appearance of the boy or girl. At the present time the only way to know whether a child has plenty of calcium is to see that a liberal supply is taken, along with a liberal supply of vitamins A, C and D, and phosphorus, all necessary to insure its best utilization."*

Proper Diet Essential

The calcium and phosphorus minerals are naturally present in milk and to a lesser degree in many of the common foods. However, foods generally contain little or none of the calcifying factor Vitamin D. The inadequacy of dietary sources, and the deficiency of solar ultra-violet impose the need for Vitamin D supplements. Vitamin D Milks and foods licensed by the Foundation are now generally available and inexpensive. Recommend them to your patients.

**NUTRITION AND THE HEALTH OF THE SCHOOL CHILD, Jour. Am. Diet. Assn. Feb. 1939. p. 73.*

Featured at THE NEW YORK WORLD'S FAIR

If you attend the New York World's Fair this summer, be sure to see how milk is irradiated for enrichment with Vitamin D at Borden's Dairy World of Tomorrow. Or visit one of the progressive dairies, evaporated milk plants or food factories in your own vicinity.

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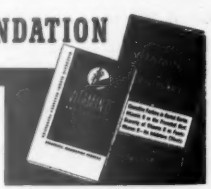

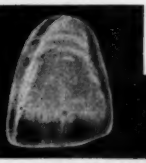

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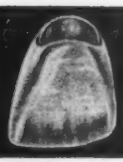

College of Dentistry, University of Southern California

GRADUATE DIVISION

The next annual Orthodontic Conference under the auspices of the Graduate Division, Course in Orthodontics, will be held at the College of Dentistry, University of Southern California, from August 5th to 10th, 1940, under the direction of Drs. Spencer R. Atkinson and C. F. Stenson Dillon. Membership is restricted to those in the exclusive practice of orthodontics who satisfy admission requirements as to standards of practice.

For additional information address:

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INSURANCE SECRETARY

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June 1, 1940

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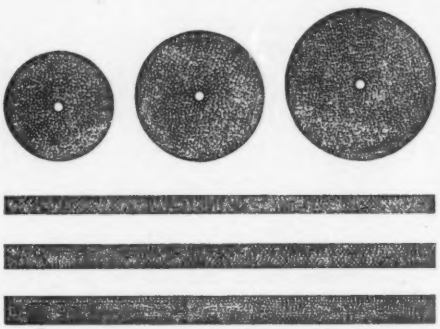

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CENTENNIAL NUMBER

1936-1938 DENTAL INDEX

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"The Centennial of American Dentistry"—

Grapefruit and the Maternal Diet

NORMAL pregnancy and lactation greatly increase the demand for all of the food elements, because the fetus acts as a parasite. If its nutritional requirements are not met through the mother's diet, food materials are secured from her body, even to the extent of breaking down the maternal tissues. Calcium, for example, may be taken from her bones or teeth.

Of prime importance during this period is an abundant, well-balanced diet, one especially rich in calcium, vitamins, and mineral salts. The mother requires a generous intake of Vitamin C, both to maintain her own health and to ensure an adequate store to the infant at birth and a sufficient supply during lactation.

Citrus fruits are an outstanding source of Vitamin C, and they provide appreciable amounts of other vitamins as well as mineral salts, citrates, and easily assimilable sugars. *Moreover, the addition of citrus fruits to the diet increases the assimilation and retention of calcium derived from other foods.*

Many dentists recommend increased citrus intake to their female patients during the periods of pregnancy and lactation.

They have found it practical to counsel the use of grapefruit juice *in addition* to the citrus fruits commonly consumed in the diet. Its fresh and invigorating flavor makes it ideal and, in its canned form, it is high in all the values attributed to the fresh fruit. Furthermore, canned grapefruit juice is economical, convenient to use and readily available at all seasons.

Grapefruit may be taken at various times of day without affecting the appetite for the coming meal.

As a variant and supplement to the habitual consumption of citrus fruit, canned grapefruit juice helps to raise the usual "minimum" intake of vitamins and minerals to that "optimum" which makes for health in mother and child.

The Citrus Commission of the State of Florida has prepared a treatise on the citrus fruits in their relation to health, with a full bibliography; a copy will be sent to any member of the dental profession upon request.

FLORIDA CITRUS COMMISSION
STATE OF FLORIDA

Dept. 28-P

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Gentlemen:

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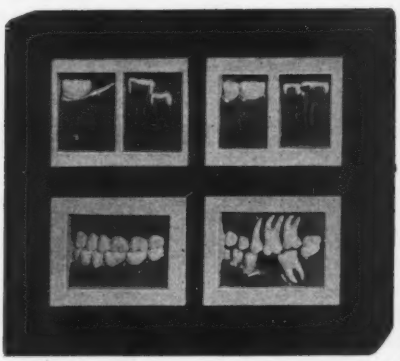

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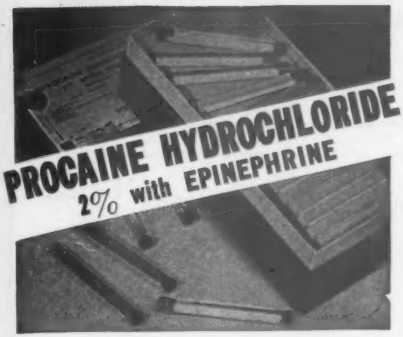

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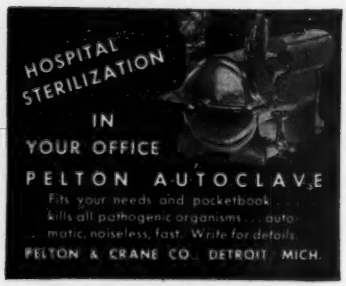
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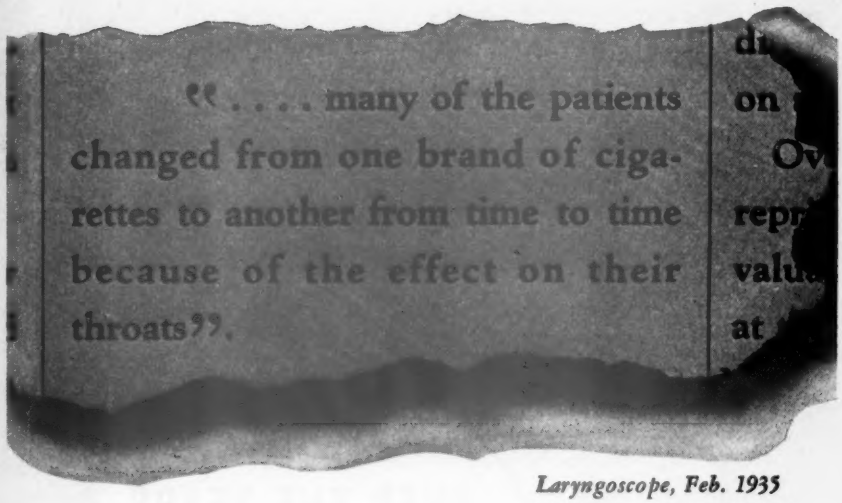
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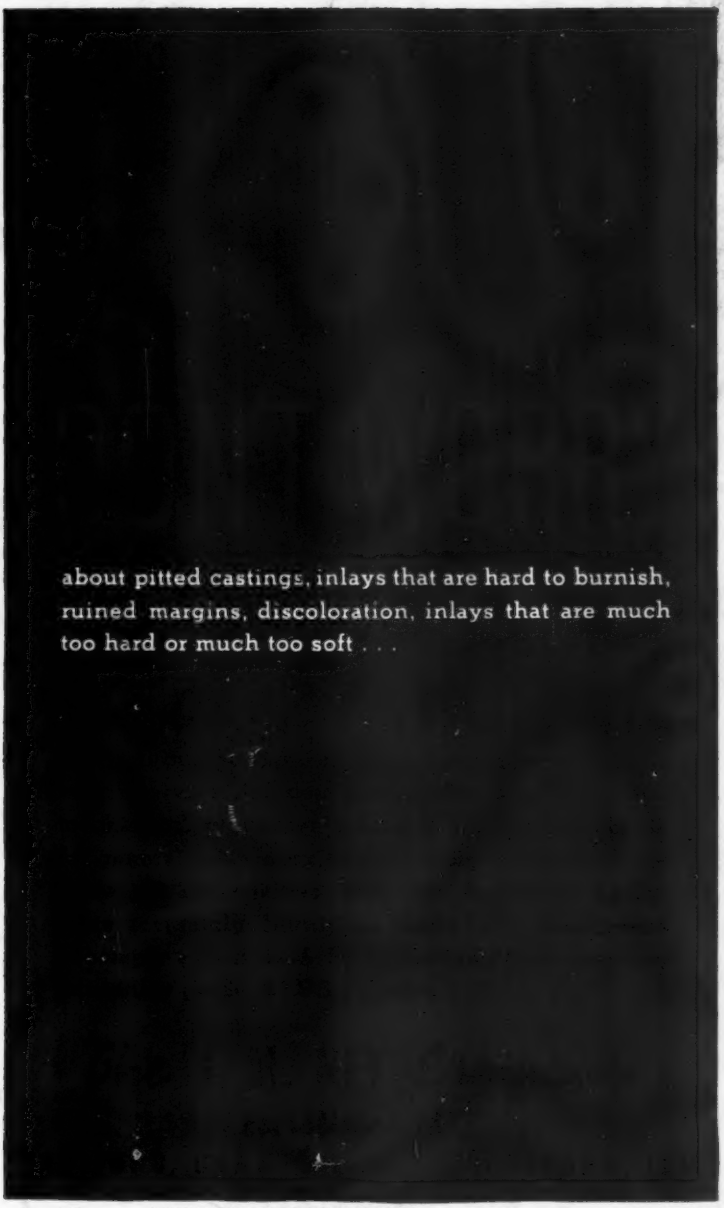
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